July 1, 1968

With comments

Grau notes to A. Boyt

OFFICE OF DIRECTOR - MSFC

CODE	NAME	INIT.	☐ ACTION	☐ INFORMATION
	Dr. von Braun			
		B 7/30		

REMARKS That's right. I'm satisfied,

Ernst Geissler says that the status of unmanned rendezvous/AAP was covered in the Baseline meeting, and he feels it would be repetitious to brief you again on Friday. However, if you need other input or still desire the briefing, he is prepared.

I think we should postpone this until after we hear the outcome of the meeting with Mr. Webb in regard to the future of ATM just in case the mode changes.

JFD 7/31

CODE	NAME	DATE
DIR	J. T. Shepherd	7-30-68

MSFC - Form 495 (Rev August 1963)

agenda ~~[illegible]~~
8/2/68
2-3:30

NOTES 7/1/68 GEISSLER

B 7/7

1. Possible Impact on AS-503 Mission Planning: An R&DO/IO meeting was held on 6-26-68, to discuss possible impacts on the AS-503 mission as a result of MSC implementing a new requirement to fly the LM cabin atmosphere with 100% nitrogen during boost, and then evacuate the LM and repressurize the crew compartment with pure oxygen in earth orbit. This procedure will require about 20 additional minutes in the attitude timeline, and will thus delay LM extraction to such an extent that S-IVB second burn cannot be accomplished at the time planned. Four possible solutions to the problem are being considered: a. Ask MSC to compress their activities in earth orbit so that the LM repressurization can be accomplished without impacting the time for S-IVB second burn. It is felt that MSC will be reluctant to do this since crew simulations have not been completed. b. Make the present AS-503 contingency mission, the prime mission. This would eliminate the present second S-IVB burn, but would leave the third burn (to escape) in the mission plan. One major LV objective would be lost, i.e., to demonstrate restart capability after a minimum coast period of 80 minutes. c. Leave the prime mission plan as it is presently, but delay the second and third S-IVB burns for one additional orbit. This would result in the third burn and propellant dump being conducted well after the guaranteed lifetime of the S-IVB stage. In addition, the tracking capability for this mission is degraded. This is being investigated by R-AERO. d. Completely redesign the mission. Some of these alternatives if required, may have a significant impact on our mission planning and even result in a slippage in the present launch schedule. A subsequent meeting will be held 7/2/68.

noted. BC 7/10/68

2. Status of Unmanned Rendezvous/AAP: To date the capability of the S-IVB stage to perform unmanned rendezvous using two mainstage burns and the current engine remains unattractive from a performance aspect. The LM/ATM can perform the same mission from a standard launch vehicle delivering 2400 lbs more payload than the above assuming a relatively efficient rendezvous technique and 2 shipsets (tankage units) of propellant. The direct ascent S-IVB using the same technique and the WACS can deliver 1400 lbs. above the two burn S-IVB. P&VE Laboratory estimates that the two burn penalty to the S-IVB stage could be reduced by 2000 lbs., but this improvement would not be sufficient to offset increased costs and lower reliability. On this basis, the appropriate action would be to abandon the two burn technique unless an idling engine is available, evaluate S-IVB fitted with the WACS to accomplish rendezvous, and pursue adding forward firing thrusters to the WACS to accomplish retro grade firing without losing radar lock. Supplementary tasks would be to determine the desirability of using S-IVB as described above with a LM/ATM as a backup to achieve highest reliability and investigate an improved engine/stage design capable of realizing a significant portion of the 8600 lb flight mechanics advantage of the two burn over any single burn mode. The proposed more efficient rendezvous technique is the Hybrid Stable Orbit Technique which would require the launch vehicle to achieve the same orbit 50 n.m. in front of the target. The rendezvous is accomplished by two successive phasing ellipses, the first of which would account for in-flight dispersions and place the LM/ATM within 20 n.m. of the CWS. Performance of the recommended tasks would permit evaluation of the extremes of performance, reliability, and cost, and would allow for some delay in making a final choice based upon the appropriate weighting of these factors in the selection.

E.G. Please lay on a more detailed briefing on these various rendezvous options, with sketches and charts. Arrange thru Jim Shepherd. B

A.

Bonnie,

Mary in Dr. Geissler's office called to schedule 1 1/2 hours for his briefing on status of unmanned rendezvous/AAP. He can be ready anytime after next Tuesday (July 30). When do you want to schedule it?

nancy
7-23

Aug. 2
Friday 1, 2 - 3:30

B 7/7

NOTES - 7/1/68 - BALCH

S-II-5 - Augmented Spark Ignition line modification has been completed on four engines and is expected to be completed on the fifth engine today. Static firing is still set for 7/17/68 but may be rescheduled to 7/23/68 as a result of MSFC negotiations.

S-II-6 - Stage was installed in the A-2 Test Stand on 6/28/68. Cryogenic proof pressure test and static firing are still scheduled for 8/22/68 and 9/4/68, respectively.

S-IC-6 - "Power-up" was accomplished on 6/25/68 as scheduled. Preparations are on schedule for propellant load test on 7/10/68. However, there is a possibility that the POGO modified LOX prevalves will be installed prior to propellant test, which could cause it to be rescheduled to 7/12/68.

Mobile Acoustics Research Laboratory (MARL) - Installation of instrumentation in the S-IVB-IB aft interstage adapter test specimen is in process. Test specimen is scheduled to be moved to the A-1 test area on 7/3/68 and to be ready for the S-II-5 static firing.

LORAN D Army Project - This is a project being conducted at MTF by the Army Electronics Command to test the LORAN D Navigation System. Erection of a 300-foot tower for use in the test has been completed, and site development work is about 98% complete. Balloon flights will also be utilized in the test. The initial test flight of the balloon on its 2500-foot tether (and antenna) is set for the end of this week.

Technical Systems for S-IC B-1 Test Stand - Turnover of Phase II Technical Systems Installation on the S-IC B-1 Test Stand was accomplished on 6/27/68. All of the installation and the contractor's checkout work is complete, and certification of acceptance without any exceptions has been furnished.

GE Service Contract - Information has been received from MSFC that their review of Amendment 143 for General Support Services at MTF during the period 7/1/68 through 9/30/69 had been completed and that the amendment was being hand-carried to NASA Headquarters for final review and approval.

NOTES 7/1/68 BELEW

B 7/7

STATUS REVIEW OF MSC EXPERIMENTS: Headquarters review of MSC experiments was conducted on June 26-27. MSC has stopped effort on critical biomedical hardware development pending receipt of the proposal on items MSFC feels it can develop.

PRELIMINARY DESIGN REVIEW: The Preliminary Design Review (PDR) was conducted on two MSFC experiments: M492, Tube Joining in Space; and M492, Electron Beam Welding, June 26, 1968 at MSFC.

WORKSHOP ATTITUDE CONTROL SYSTEM PRELIMINARY REQUIREMENTS REVIEW: The Workshop Attitude Control System (WACS) Preliminary Requirements Review was held on June 25, 1968 at MSFC.

ATM EXPERIMENTS: Briefings were given to Drs. Naugle and Mueller at NASA Headquarters on June 27, on substituting the modified HCO-A instrument for the present HCO-C scanning spectrometer. Dr. Reeves from Harvard College Observatory (HCO) presented a description of the proposed modified HCO-A instrument and the scientific improvements gained. MSFC presented the impact of such a change on the ATM design and the schedule and cost aspects of the HCO-A modified effort. Verbal guidance was provided to MSFC to cease further effort on the HCO-C experiment and to authorize limited long lead time procurements toward the HCO-A modified instrument. A survey team was requested to visit Ball Brothers Research Corporation to assess impact of this new effort on their other projects.

AMERICAN SCIENCE & ENGINEERING (AS&E) EXPERIMENT S054 CRITICAL DESIGN REVIEW (CDR): A CDR for the AS&E ATM Experiment S054, was held in Cambridge, Massachusetts, June 24-26. The CDR went smoothly with no major deficiencies noted.

ATM EVA WORKING GROUP MEETING: The ATM EVA Working Group met for the second time at MSFC on June 27. The next meeting is scheduled for July 18, at MSC. We hope to have a 1/10 scale mockup of the AM, MDA, and LM/ATM with the translation rails included for the next meeting.

SATURN I WORKSHOP THERMAL CONTROL SYSTEM (TCS): After discussions with P&VE we have (through MSC) requested MDC (St. Louis) to evaluate the impact on the AM Thermal Control System of increasing the atmosphere flow into the Saturn I Workshop. This is a part of the current P&VE effort to effect an integrated thermal system design for the MDA/AM/Saturn I Workshop. The potential advantages of this approach are (1) sizeable reduction in power requirement for the Saturn I Workshop, and (2) some simplification of the Saturn I Workshop TCS).

NOTES 7-1-68 BROWN B 7/7

GENERAL - Reference your question as to my position on Mr. Grau's notes of 5/13/68. 1. The practice of qualifying flex lines by "similarity" has been used in the engines, stages and GSE. 2. Qualification of the J-2 engine lines as a group, utilizing the engine as the test bed, was a P&VE recommended approach (with which the Engine Program Office agreed). The program included 10,000 seconds of engine hot fire environment exposure for all lines and ducts. The record shows that Qual Lab participated in approval and execution of the J-2 engine Component Qualification Program. 3. To my personal knowledge, for the past 12 years we have not been and are not now so short of funds in the engine area that we knowingly took or will take undue risks. No consolidated R&DO position on the design, test, qualification and/or requalification has ever failed to be implemented by the Engine Program Office, except in those very few cases that the Center has decided that schedule or other program considerations should override.

F-1 ENGINE - Continued engine system testing at RETS has reduced the concern for the abnormal gas generator oscillations experienced earlier during helium injection tests. Testing under aggravated conditions has not produced out-of-specification engine or gas generator performance. Evaluation of the use of the prevalve as an accumulator is continuing both at Rocketdyne and MSFC.

F-1 engine F-6078 arrived at MSFC and will be provided to R-QUAL as a part of the Quality Maintenance Program. Plans are to perform a Receiving Inspection and Checkout, after which the engine will be disassembled and inspected in detail. This engine is one of the first five that had been shipped from Seal Beach, California to MAF aboard the USNS Point Barrow.

J-2 ENGINE - The post firing inspection of the J-2 engines following the June 19 S-II Battleship firing revealed that the main injectors on two engines were contaminated. A piece of lip seal material was missing from one stage prevalve and is believed to be the contamination source for one engine. The source for the other engine is believed to be residual contamination from a facility valve that had failed previously. Further inspection showed the fuel pump impeller, on one engine, to be nicked from some hard material. The decision was made to replace the fuel pump and to run with the known injector contamination.

Leak checks of the J-2 engine (J-2033) on AS-205 disclosed excessive leakage past the fuel poppet of the gas generator control valve. A thrust variation of ±500 pounds can be expected if the valve is replaced. R&DO has checked the AS-205 mission requirements and determined the possible loss in payload to be unacceptable. Therefore, the valve was removed Friday, June 28 and returned to Rocketdyne for corrective action. The valve should be returned to KSC for installation on Wednesday, July 3, without schedule impact if the leakage is the result of contamination trapped between the valve poppet and seat as suspected.

NOTES 7/1/68 CONSTAN

B 7/7

Nothing of special significance.

NOTES - 7/1/68 - EVANS

B 7/7

1. Reply to the MSF Safety Survey Report. A reply to the report of the Safety Survey conducted by the Manned Space Flight Safety Office on May 7-8 at MSFC has been directed to Dr. Mueller. This reply was staffed primarily by R&DO and the IO Safety Office. Copies of the reply have been given to Messrs. Gorman, Weidner and General O'Connor as well as each of the Safety Board Members, and it was recommended to the recipients that positive efforts should be made to follow-up the corrective actions which are indicated in the report. ✓

2. NASA Hazards Identification Committee (NHIC)

The third meeting of the NHIC is scheduled to be held at NASA Headquarters on July 1. The primary mission of this committee is to identify hazardous conditions for which NASA should have Safety Standards. It is composed of sub-committees including:

1. Crew and manned missions
2. Hardware Systems
3. Unmanned mission and launch operations
4. Industrial and facility
5. Transportation and storage
6. Research and development
7. Public safety
8. Aviation
9. Environmental

Dr. Mrazek is Chairman of the overall committee. ✓

3. MSFC Safety Director

Mr. Murphy assumes Safety activities on a full time basis as of today. His office is located on the 6th floor, building 4200, Room 612-A. ✓

4. Safety Board Meeting No. 19

The MSFC Safety Board conducted its 19th meeting on Friday, June 28. One item was a review of the findings of the recent Safety/Fire Inspection by four (4) teams. Many housekeeping and fire regulation violations as well as violation of safety standards of a more serious nature were recorded. A report is being prepared and will be followed for corrective action. This safety and fire inspection was established in follow-up to the MSFC Safety Survey on May 7-8. ✓

NOTES 7-1-68 Fellows

B 7/7

Negative report.

NOTES 7/1/68 GEISSLER B 7/7

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Noted. BB 7/8/68

2. Status of Unmanned Rendezvous/AAP: To date the capability of the S-IVB stage to perform unmanned rendezvous using two mainstage burns and the current engine remains unattractive from a performance aspect. The LM/ATM can perform the same mission from a standard launch vehicle delivering 2400 lbs more payload than the above assuming a relatively efficient rendezvous technique and 2 shipsets (tankage units) of propellant. The direct ascent S-IVB using the same technique and the WACS can deliver 1400 lbs. above the two burn S-IVB. P&VE Laboratory estimates that the two burn penalty to the S-IVB stage could be reduced by 2000 lbs., but this improvement would not be sufficient to offset increased costs and lower reliability. On this basis, the appropriate action would be to abandon the two burn technique unless an idling engine is available, evaluate S-IVB fitted with the WACS to accomplish rendezvous, and pursue adding forward firing thrusters to the WACS to accomplish retro grade firing without losing radar lock. Supplementary tasks would be to determine the desirability of using S-IVB as described above with a LM/ATM as a backup to achieve highest reliability and investigate an improved engine/stage design capable of realizing a significant portion of the 8000 lb flight mechanics advantage of the two burn over any single burn mode. The proposed more efficient rendezvous technique is the Hybrid Stable Orbit Technique which would require the launch vehicle to achieve the same orbit 50 n.m. in front of the target. The rendezvous is accomplished by two successive phasing ellipses, the first of which would account for in-flight dispersions and place the LM/ATM within 20 n.m. of the OWS. Performance of the recommended tasks would permit evaluation of the extremes of performance, reliability, and cost, and would allow for some delay in making a final choice based upon the appropriate weighting of these factors in the selection.

E.G. Please lay on a more detailed briefing on these various rendezvous options, with sketches and charts. Arrange thru Jim Shepherd. B

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NOTES 7/1/68 HAEUSSERMANN

B-7/7

1. ATM Items of Discussion with NASA Headquarters. The following ATM subjects were discussed at NASA Headquarters on June 27/28.

a. Harvard College Observatory ATM Experiment. Dr. Reeves of HCO presented to NASA Headquarters (Drs. Mueller/Naugle, Mr. Mathews and others) information on the change from the HCO "C" experiment back to HCO "A". MSFC presented the ATM impacts for this change. NASA Headquarters decisions were to terminate the efforts on the HCO "C" experiment and MSFC should proceed with the establishment of the details of the ATM to the HCO "A" experiment interface. American Science and Engineering was the designer/fabricator for HCO "C". Ball Brothers will be the designer/fabricator for HCO "A". NASA Headquarters also expressed some concern about HCO being able to properly staff as required for HCO "A" schedule. A decision was made to stop efforts on the HCO "B" experiment which was in an early state of definition for the next ATM solar experiment.

b. Dr. Mueller raised the question about the need for testing of the ATM fine sun sensor with a solar simulator. We have recognized the shortcomings of the type of testing since these tests will not conclusively prove the accuracy. Dr. Meuller's main objective was of a cost saving aspect (three simulators would cost approximately $80,000 with some degree of uncertainty how good the simulator would be). Further evaluation will be made on this subject. (NOTE: The prototype of the fine sun sensor was delivered today and in-house testing will proceed.)

c. ATM Star Tracker. MSFC presented the star tracker Source Evaluation Board findings and the results were generally accepted. A final Headquarters decision is still pending as to whether MSFC can proceed or whether Mr. Webb will have to make the source selection. The implication was that Mr. Webb would not have to be involved.

d. ATM Digital Computer. MSFC also presented the digital computer Source Evaluation Board findings on June 28 with results similar to those stated above on the star tracker. However, NASA Headquarters wants a re-evaluation on the use of the LM computer for ATM in view of the fact that MSFC may be now responsible for the LM and the computer software.

NOTES 7/1/68 HEIMBURG B-7

1. F-1 Engine (POGO TESTS) Test FW-086 was conducted on the West Area F-1 Test Stand on June 25, 1968 with F-1 engine S/N F-2009-1 for a mainstage duration of 104 seconds. Primary purpose of this test was to evaluate the LOX prevalve accumulator POGO fix. Tests FW-087 through FW-090 were conducted on June 28, 1968. Data from these tests are being evaluated.

2. F-1 TURBOPUMP POGO TESTS Four tests were conducted last week. First test was run on 6/25 and consisted of a 120 second firing with lox suction line pulsing (2 to 22 cps). This was a base-line test at 110 psia lox pump inlet press without helium injection. Second and third tests were conducted on 6/28 using the lox pump discharge line pulser with pump inlet pressures of 110 psia and 130 psia respectively. Pulsing frequency was varied from 1 to 17 cps with helium injection (0.02 #/sec) into the prevalve cavity. Test number four was conducted on 6/29 using upstream pulsing (8 to 20 cps) with helium injection into the suction line at 0.05 #/sec for the first part of the test and helium injection into the prevalve cavity at 0.025 #/sec for the last part of the test. These tests satisfy the P&VE Lab data requirements for the July 15 decision on POGO Fix. Turbopump testing will be suspended until approximately July 13 to accomplish static tests on S-IB-12.

3. S-II STRUCTURAL TEST PROGRAM The Phase IIA test has been re-scheduled by R-P&VE for July 3, 1968. R-P&VE has expressed confidence that their instrumentation problem can be resolved and ready by the above date! Eighteen per cent of their instrumentation is presently defective.

4. ACCESS ARM (#9) TESTING Participated in a meeting between KSC (Middelton, Preston, and Buchanan) and Boeing (Nelson, Cully, Driggers) concerning Boeing swing arm activities here at Huntsville and causes for schedule slippages. Also discussed slippages on Arm 9 hardware and the lack of common sense engineering when problems arise. KSC did recognize the need for a full time engineering manager in Huntsville and plan to have Mr Allen back on TDY. He was here during the bulk of Flows 2 and 3 swing arm test activities.

5. S-IVB (MSFC) Since June 12, 1968, four tests have been run on the newly designed ASI assembly (rigid Lines) for a total of 1035.5 seconds. On June 12 two tests for 399.7 and 200.0 seconds; On June 14 a test was planned for 400.0 seconds, however it was cut off at 42.8 seconds due to a cryogenic leak at the fuel injector pressure pickup line which had been inadvertantly left disconnected. On June 26 a duration test of 393 seconds was run. All test objectives in this series were met and the operation and performance of the engine and stage systems were satisfactory.

6. S-IB (MSFC) The S-IB-12 propellant loading test is scheduled for July 3, 1968.

7. APOLLO TELESCOPE MOUNT Component tests which have begun on the chain drive assembly resulted in discovery of several design deficiencies. These problems although rather small will delay testing until modifications can be made to this assembly.

8. MODERATE DEPTH LUNAR DRILL Northrop contract was signed as of June 24, 1968. Westinghouse contract is scheduled to be signed on July 28, 1968.

NOTES 7-1-68 HOELZER

3 7/7

NEGATIVE REPORT.

NOTES 7-1-68 James

B 7/7

1. AS-503 Flight Program: We have been informally advised that George Low is considering having the LM purged with nitrogen at the time of lift-off. The astronauts would then have to change from a nitrogen to an oxygen atmosphere after boost and prior to Spacecraft separation. We are reviewing the impacts and alternatives which include:

a. The possibility of MSC shortening the timeline by reducing the number of secondary requirements.

b. Having the primary AS-503 mission contain only one SIVB restart (present planning is for two restarts).

c. Delay orbital actions for one orbit. This will require a new look at the telemetry/ground station coverage and IU lifetime extension to 7-1/2 hours.

d. Development of a complete new AS-503 mission. (This is of very low probability). The first two alternatives do not impact the flight program development, whereas the last two cause impacts of one month and nine months respectively. ✓

2. Extension of Teleconference Capability to MSFC: By direction of MSF, speaker telephones have been installed in the Apollo Control Centers at Washington (Phillips), MSC (Low), KSC (Middleton) and the Saturn V Control Center. These phones are connected through the green network ("hot-lines" that connect Dr. Mueller, and other key officials at MSF, MSC, KSC, and MSFC); therefore, we now have a secure teleconference system available. General Phillips has also authorized extensions of the Boeing (TIE contract) Long Distance Xerox (LDX) system into each of the three Centers. This is the equipment that permits the rapid and high quality transmission of charts and other data that are used in the teleconferences. The LDX equipment will be at MSFC by July 5, and is to be operational by August 1. ✓

3. Saturn V Space Vehicle Structural Assessment: We (Saturn V and P&VE) have met with MSF and Boeing TIE representatives to discuss the structural assessment of the Saturn V Space Vehicle (requested by General Phillips). In accordance with agreements reached, MSFC will submit a list of critical structural elements to each Stage Contractor for a thorough review, appropriate MSFC and Boeing TIE personnel will then visit the contractor's facilities and review each critical aspect of the design and manufacturing process, and the results and conclusions will be included as part of the Space Vehicle Structural Assessment Report. ✓

4. S-II-3 Stage at KSC: The S-II-3 stage was shipped from MTF on June 23, and arrived at KSC on June 27, four days ahead of schedule. ✓

NOTES 7/1/68 JOHNSON

B 7/7

NASA Sterilization Technology Seminar. The NASA Sterilization Technology Seminar was conducted at Kennedy Space Center, June 10-13, 1968. MSFC had assisted Mr. Larry Hall of Headquarters in formulating the agenda and planning for the Seminar. The consensus was that the sessions had been both interesting and extremely worthwhile. It is tentatively planned that the next session will be held at MSFC and that Mr. Fred Beyerle of the ME Lab will serve as the individual responsible for leading preparations for the next session. No date has been established. NASA's Planetary Quarantine Advisory Committee (PQAC) met during the time of the Seminar. Dr. Roy Cameron, JPL, gave a very interesting presentation of the expedition which he recently lead to Antartica collecting soil samples and conducting investigations on the conditions affecting life forms.

Preliminary Design Review. Preliminary Design Reviews for the Electron Beam Welding and Tube Joining Experiments were conducted on June 26. Twenty-five open action items resulted. These concerned principally procedures and specifications for the KSC activities, safety precautions in connection with action operations and actions to clarify documentation and integration requirements. This was the first experiment PDR conducted by MSFC and, as such, was primarily a learning experience. The most frequent complaint concerned the lack of preparation time because of late distribution of review material. Otherwise, the PDR was quite satisfactory and probably provides a good basis for conducting future reviews of other experiments.

Bi-Monthly Experiment Status Review. The first Bi-Monthly Status Review of Experiments under development at MSFC was conducted by members of the Headquarters AAP Office. A brief summary of the material presented is in publication and a copy will be provided to you. In general, the review went quite well; however, it is questionable at this point whether benefit gained from such a formal review adequately compensates for the time spent in preparation. The value of such reviews on a bi-monthly basis is certainly questionable.

B 7/7

NOTES 7-1-68 KUERS

1. Review of Apollo Manufacturing Cost Proposals: At the request of Mr. W. Gray, Apollo NASA Resident Manager, the ME Laboratory is furnishing temporary additional support at NAR Downey to review cost estimates on change proposals. Two manufacturing planners from the Planning and Tool Engineering Division have already reviewed the manufacturing portion of 15 proposals, valued in excess of $1.5M. They are presently involved in the review of proposals totalling over $100M. Recommendations by manufacturing engineering personnel on the first 15 proposals could amount to sizable savings after final negotiations. The total potential savings on the remaining work package will be appreciably higher. ✓

2. Damper Arm Systems: We are still performing work on these systems in support of the Qualification Test Program. Further, during this week alone, we shipped to KSC over 50 line items for modification kits. ✓

3. Experiments Preliminary Design Review: The PDR for the R-ME originated space experiments M-493, Electron Beam Space Welding Gun, and M-492, Space Exothermic Brazing Experiment, was held June 26 at MSFC. The review team was made up of members from Headquarters, MSC, KSC, R-P&VE, R-QUAL, R-ASTR, and R-ME. This was the first experiments PDR held by NASA. The PDR was beneficial and (a) firmly established IO and the AAP Office as experiments management, (b) established formal communication between all segments involved with accompanying responsibility, (c) gave further and definite direction to the principal investigator and team (there were 24 action items), and (d) established a precedence and provided experience in preparation and conduct of an experiments PDR. ✓

4. Demonstration for U. S. Maritime Commission: Magnetomotive forming equipment and techniques were demonstrated by our personnel at Avondale Shipyard, New Orleans, La. Approximately 50 supervisory and managerial personnel from the Navy and various shipyards witnessed the demonstrations. Lively question and answer sessions followed. This demonstration was made at the request of the U. S. Maritime Commission. ✓

B 7/7

NOTES 7-1-68 LUCAS

1. POGO: The analytical updated F-1 engine transfer functions have been received from Rocketdyne. The amplitude or gain is approximately 10% greater than the values presently used. The change in stability margin will be determined as soon as the revised values can be incorporated into the vehicle stability program. This change in transfer function is in the direction of less vehicle stability margin. The planned testing program is on schedule and nothing has developed that indicates that we will not be able to make a decision on a fix by 7-15-68. Preliminary CCSD stability results show AS-205 to be stable throughout flight time (gain margin of 5 dB or greater).

2. S-II-11 COMMON BULKHEAD: Ultrasonic inspection of the S-II-11 common bulkhead has revealed numerous, large debond indications. North American Rockwell (NR) has made some special tensile tests and recommends that the bulkhead be accepted "as is." We are investigating the condition. This is the second common bulkhead in a row that has had major problems and seems to indicate a deterioration in workmanship; R-QUAL is surveying the situation.

Roy Godfrey I.O. What do you suggest? B

3. S-II MATERIAL: Several weeks ago NR/SD reported alarming stress corrosion data on Reynolds aluminum purchased against the MB0170-063 material specification. This material did not meet the 063 specification and was qualified to the normal MB0170-021 specification and used in S-II-9 and S-II-10. On investigation, we learned of many disparities in the testing technique, the test fixtures, and the test material. Although NR/SD did not agree with our analysis, both we and they retested the material. Neither organization was able to duplicate the earlier data. NR/SD has now concluded that there is no problem, a conclusion which we suggested several weeks ago and with which we still agree.

4. WORKSHOP ATTITUDE CONTROL SYSTEM (WACS): The Preliminary Requirements Review (PRR) was held at MSFC June 25, 26, 1968. Approximately 130 NASA and contractor representatives attended the technical briefings the first day. The senior NASA Headquarters representative was Phil Colbertson. The Senior Board will meet on 7-9-68 for final disposition of Review Item Discrepancies generated during the PRR.

5. EVA AD HOC WORKING GROUP MEETING: At the second meeting held at MSFC on 6-27-68, an intercenter design team (MSC & MSFC) under P&VE chairmanship was established. This team will direct the preliminary design of the baseline manual fixed rail system for both astronaut translation and film transfer. An EVA concept selection of the preferred automated mechanical system is scheduled for the next meeting on 7-18-68, if it is concluded that an automatic system is required. The considerations should be completed prior to the PDR in mid-August.

6. S-IVB FORWARD SKIRT SHELL STABILITY: MSC and LRC (Langley) reportedly were concerned about the shell stability of the S-IVB forward skirt and the immediate structure above. Dr. Fulton of Langley states that he has adequate definition of the S-IVB stage now and that no serious S-IVB problem exists. Presently, he is concentrating on the LEM Adapter (SLA area) analysis as related to the AS-502 anomalies.

7. MSC RESEARCH CONTRACT: Dr. Gosnell of NARMCO reports that his company has been awarded a contract from MSC to develop a non-flammable adhesive. The work is to be based on the results of our contract NAS8-11068 with NARMCO for development of a LOX compatible adhesive.

NOTES 7/1/68 MAUS

B 7/7

NOTHING OF SIGNIFICANCE TO REPORT

NOTES 7/1/68 RICHARD

B 7/7

AS-503 Problem: MSC has decided to pressurize the LM with a gas other than oxygen (probably nigrogen) for boost flight. This requires repressurization in earth orbit prior to LV/SC separation in order to have an oxygen environment for crew entry to connect the S-IVB/LM separation pyrotechnics, check LM/CSM latch-up, etc. We have received word from MSC (Mr. Low to Col. James) that this activity impacts the present orbital timeline and have been asked to determine what we can (or must) do in order to accommodate it.

A meeting was held on 6/26/68 and four possible alternatives were discussed. These are briefly summarized as follows:

a. MSC shorten the crew timeline of activities. If T&D was started as soon as possible after the first darkness pass and completed before Hawaii, the LV inhibit could be removed via ground command from Hawaii and the L/V mission could continue as presently planned.

b. Utilize the presently defined contingency case (i. e., alternate TB_{8a}) as the primary mode. This leaves the L/V planning unchanged but we have only one S-IVB restart.

c. Delay the L/V post-separation activities for one revolution. The affected areas identified were: (1) software impact, (2) telemetry coverage, (3) APS quantity or usage, and (4) IU lifetime (approximately 8 hours).

Items (3) and (4) appear to be no problem except for the contractual aspects of exceeding IU lifetime; however, this would not necessarily require a contractor "guarantee" or commitment, but just agreement that it could be done if MSFC assumes responsibility. Item (1) will have to be absorbed by the program if this alternative is chosen. We are to have answers on item (2) by 7/2/68.

d. New mission - changed burn times, timelines, etc. This appears to be out-of-question for 503. ✓

Presently the order of desirability for the identified alternatives is a, c, b, and d. I have scheduled another meeting for 7/2/68. Mr. Bell, I-V-E, indicated this date will satisfy Col. James response time to MSC, and it will also give R&DO labs a little time to further checkout various aspects of the above alternatives. I will keep you informed of results. ✓

B 7/7

SPEER 7/1/68

S-II LOX Slow Fill Effect on Launch: During the Staff and Board Meeting on June 14, the question arose of the effect of S-II LOX slow fill on our capability to launch within a lunar launch window. The Boeing math model indicates that slow-fill results in approximately a 6% reduction in Launch Vehicle Availability (LVA) to launch in a single three hour window, and a 5% reduction in LVA for a three window launch opportunity. The primary operational advantage of the fast-fill appears to be saving an hour of launch crew time. Assuming that the current constraint limiting the primary launch crew to a 12 consecutive hour work shift prior to liftoff is maintained, the total amount of count time after beginning cryo loading is limited. Lengthening the nominal count time by S-II slow fill then reduces the hold time available for correction of problems encountered late in the count.

NOTES 7-1-68 Stuhlinger

B 7/7

1. STABILIZED PLATFORM FOR EMR-TYPE EXPERIMENTS: Dr. Roman and other OSSA representatives met with Principal Investigators of the UV experiments for the EMR platform and with members of ASTR and SSL to review the progress of platform design and development. OSSA members commented very favorably on MSFC's work.

2. NUCLEAR ENGINE TEST: Members of SSL attended a firing test of the Phoebus 2A nuclear engine in Nevada. Preliminary analysis indicated a successful experiment with a running time of 15 minutes, power level of 4,200 megawatts, and a thrust level of 220,000 pounds.

3. NEUTRON ALBEDO EXPERIMENT: Members of Oak Ridge National Laboratory and SSL jointly checked out the detectors and instrumentation for the neutron albedo experiment. Tests run in the altitude simulation chamber at MSFC have uncovered some troubles in the circuitry. These will be worked on further at ORNL, and the equipment will be returned to MSFC the week of July 1. After a satisfactory checkout, the complete experiment will be taken to Palestine, Texas for a balloon flight. Ambrose Byrd and Wally Parker, SSL, are working closely with the ORNL people and will oversee the balloon experiment.

4. SOLAR PHYSICS SUBCOMMITTEE MEETING: Gary Arnett, SSL-T, attended this meeting earlier in June. Concern about the continued slippage of the ATM launch date prompted the Subcommittee to draft a resolution which encourages NASA to look at alternate ATM concepts (i.e., decoupled mode, etc.) to enhance the probability of a 1971 launch date. The mission duration was not specifically mentioned in the recommendation, but Subcommittee members felt that anything less than a 28-day mission could not be accepted.

5. LOSS OF YOUNG SCIENTISTS: Dr. Ron Merrill, who joined SSL six years ago and received his Ph.D. two months ago, decided to leave NASA and to join the staff of Brigham Young University. He specialized in thermal physics, thermal control, and infrared physics. His reasons for leaving are twofold; first, the present job insecurity of young scientists with few retention points, and second, the great difficulties that SSL encounters in obtaining technicians and engineers to support experimental work in the laboratory.

6. THERMOPHYSICS CONFERENCE: Gerhard Heller chaired the Thermal Design Session at the AIAA Thermophysics Conference in Los Angeles last week. Heller and Snoddy will help to edit the Thermophysics volume of the AIAA Progress Series, based on the Los Angeles Conference.

NOTES 7/1/68 TEIR

B 7/7

CCSD (CHRYSLER) FOLLOW-ON PRODUCTION: Contractual coverage for long lead time materials and effort on S-IB stages 213 to 216 (Schedule VI of the CCSD contract) would have expired on June 30, 1968. Following a meeting of Mr. Webb with Mr. Finger and General Bogart Friday afternoon, Mr. Webb authorized extension of the effort for 30 days with a manpower limit of 205 and funding limit of $560,000. Work was to be restricted primarily to 213 and 214. However, because of committed but incomplete work with some subcontractors we were able to get this authority extended to include work on 215 and 216 limited to completion of only that work that has been committed to subcontractors or vendors. ✓

S-IVB ORBITAL WORKSHOP (OWS) EFFORT: Contractual coverage for the OWS which would have expired on June 30, 1968, was extended to July 28, 1968, with a funding limit of $1,600,000. ✓

FLEX LINES: Reference is made to my notes dated 6/24/68 (copy attached) concerning investigation of subject lines to determine susceptibility to flow induced vibration. R-P&VE finalized the criteria for analysis and testing of metal flex lines on June 27 and by working with the contractors have developed a list of flex lines which they recommend be considered candidates for testing under environmental flow conditions prior to the SA-205 mission. Tests of all Category I (loss of crew) lines are to be completed prior to the SA-205 Preflight Review with testing of Category II (loss of mission) lines being completed prior to the launch of AS-205. There are no metal flex lines that require testing on the IU or MGSE. ✓

AS-205 SPACE VEHICLE OSCILLATION STUDY: A dry run of the information MSFC will present on the above subject at the MSC DCR on July 10 is scheduled for 2:00 PM, July 8, 1968, in Room 5045, Building 4610. ✓

NOTES 7/1/68 WILLIAMS

B 7/9

1. Lunar Systems: B. Milwitzky chaired two sub-working group meetings on June 20 and 21, 1968, leading to the following assignments for MSFC:

a. Lunar Roving Vehicle (LRV) - MSFC was assigned the task of defining by end of August an LRV capable of being carried by an ELM for a 1972-73 time frame. Other supporting tasks were also assigned.

b. Lunar Landing Vehicle (LLV) - MSFC was assigned the definition of an LLV for the Saturn V launch vehicle and for the Saturn IB/Centaur and T-III-D/Centaur. Other supporting tasks were also assigned.

2. Nuclear Program: NASA Headquarters has requested the MSFC results of the BOB study be available by Monday, July 1, 1968. Cost of facilities to support the nuclear program are being obtained through the MSFC Facilities Office and from the SNPO.

The Phoebus II-A hot firing was conducted at NRDS June 26, 1968. The test power level was limited by the temperature of the nozzle clamps which reached red line value, as was anticipated from the results of the previous low power run. Preliminary indications are that a power level of 4360 MW was achieved (design power is 5000 MW). It was a full duration test, however, and besides the power level limitation, the test appears to have been highly successful. Current plans are to conduct a second test July 11, 1968.

July 8 1968

9-26-68

With comments

Balch notes to Gorman Urgent
Bof 7-18-68

jts 7-18

~~1. Eb~~ Bh
~~2. Mall~~ Mp
3. Nancy

7/8 FRS

B 7/9

NOTES - 7/8/68 - BALCH

S-II-5 - Augmented Spark Ignition line modification has now been completed on all five engines. LOX sump screen modification has been completed, and LOX tank is closed. Static firing was rescheduled from 7/17/68 to 7/23/68, but stage contractor's current work plans call for a 7/19/68 firing date.

S-II-6 - Modification period which was planned for 7/1/68 to 7/18/68 may be extended due to late delivery of mod kits. Out of ten mod kits required at MTF by today, nine do not yet have firm delivery dates. Schedule still calls for cryogenic proof pressure test on 8/22/68 and static firing on 9/4/68.

S-IC-6 - Decision was made to install POGO-modified LOX prevalves prior to propellant load test, and propellant load test has been rescheduled from 7/10/68 to 7/12/68. Prevalves to be installed are on site. Static firing is still scheduled for 8/6/68.

Emergency Planning - A 15-hour medical self-help training program was completed at MTF on 6/28/68, with 39 NASA, Boeing, General Electric, and North American Rockwell employees participating. The program was conducted by representatives of the MSFC Office of Emergency Planning, with assistance from the local medical department

→ Harry G.

Did we ever have a program like this in Huntsville? Sounds worthwhile B

NOTES 7/8/68 BELEW

B 7/9

7/8/68

CENTERS' PRESENTATION TO HEADQUARTERS ON NEW START TYPE MODULAR CONCEPT SPACE STATION: Presentations were made at Headquarters on June 28, by LaRC, MSC, and MSFC, giving their respective concepts for a modular type space station.

LaRC recommended using the NASA/MOL with the two-man Gemini and the Titan IIIC as a booster. They recommended the IB's be dropped from the program. The presentation in general did not seem to be well received since it offered limited advancement in technology leading to a full-blown space station and did not accomplish the objective of extending man's duration in space since the MOL is designed for only 30 days.

MSC's presentation was oriented toward: (1) a SLA type space station, consisting of a Command Module or a "big" Gemini capsule, (2) a module replacement for the Service Module containing only orbiting and deorbiting equipment and propellant, and (3) a laboratory module which would be the basic station subsystem module containing all life support equipment and supplies, could be developed in three years at a cost of $200M.

MSFC's presentation was for a modular concept where each module would have its own life support facilities, crew quarters and experiment compartments. Each module could operate independently or several modules could be joined together in space to provide a space station capability. The module would require an uprated IB or a Saturn V vehicle for launch. ✓

LM-A SYSTEMS TECHNICAL MANAGEMENT MEETING: The first LM-A Systems Technical Management Meeting was held at MSC July 2. Grumman and MSC requested information on the AAP-4 shroud design, jettison motor blast effects on the LM, and AAP-4 vibrations, particularly if this environment is different from the Apollo LM environment. Grumman presented the deletion in LM-A requirements if the manned docking capabilities were eliminated and if environmental control, cooling, and power were provided from other parts of the cluster. Grumman needs baseline requirements for a dormant LM to allow detailed design and fabrication to commence in keeping with a 1971 launch date. ✓

ATM DIGITAL COMPUTER: On June 30, MSFC made a presentation to Headquarters on procurement of ATM Digital Computer. It is our understanding that the decision was made for MSFC to execute the procurement provided we first reexamine the idea of utilizing LM computer for ATM operations. We are writing a letter to Mr. Luskin giving a summation of our reasoning for a separate computer, and plan to go ahead and implement a separate computer buy. ✓

NOTES 7-8-68 BROWN B 7/9

H-1 Engine - Reference my notes of 6/24/68 regarding H-1 flight worthiness verification testing.

Static testing has been successfully completed on AS-205 Flight Worthiness Verification (FWV) Engine H-7053. This engine has now accumulated 17 starts and 2116 seconds total firing time, which exceeds the minimum qual life requirement of 15 starts and 2025 seconds. The engine will now be subjected to functional tests and checkout followed by a complete teardown to assure that all components are still in flightworthy condition. The final H-1 Engine FWV report will be issued 30 days prior to the flight of AS-205.

F-1 Engine -

POGO - At RETS, installation of an S-IC type prevalve in the test stand has been completed and tests are underway. Four tests have been conducted to evaluate the prevalve accumulator including the effect of helium on engine start, mainstage and shutdown, and possible gas generator oscillations. Three tests will be completed this week to support the POGO working group meeting on July 11, 1968. Following the decision on the POGO solution, ten additional tests will be conducted to demonstrate the compatibility of the solution with the F-1 engine prior to the scheduled S-IC-6 test on August 6.

Seven turbopump tests have been conducted at MSFC since June 24. The objective of these tests was to establish first and second modes of the natural frequency of the feed system. Results are consistent with similar tests previously conducted in that with helium injection the first mode natural frequency was reduced from approximately 5 to approximately 2.5 cps. There were indications of a second mode frequency at 12-14 cps.

J-2 Engine - Previously, the ASI assemblies for AS-503 had been reworked to correct an out-of-flatness condition of the ASI to dome mating surface. As a result of this rework, the ASI recessed into the dome too far and interference has been experienced between the ASI lines and the dome. Grinding of a relief in the engine domes to provide clearance for the lines is underway. Work has been completed on four engines. Current estimates are that remaining work will be completed by July 9.

A pressure test on the ASI assembly on the engine in S-IVB-503 indicated leakage. Further checking with vacuum showed internal ceramic to metal leakage at the tip of the spark plug. The assembly is in process of being replaced with a new one. Grinding of the reliefs in the engine dome as described above will be accomplished during change-out of the ASI.

NOTES 7/8/68 CONSTAN

B 7/9

Nothing of special significance.

B 7/9

NOTES - 7/8/68 - EVANS

Nothing of significance to report - Safety

NOTES 7/8/68 FELLOWS

B 7/9

Nuclear Energy Conference: In mid-June, I chaired a session on Propulsion Reactor Technology at a combined joint meeting of the American Nuclear Society and the Canadian Nuclear Association. The meeting, held in Toronto, drew a registration of 750-1000. In the main, the conference was dominated by the Canadian power industry. (For instance, a high official of Ontario Hydro announced at the main banquet company plans for the construction of additional nuclear power plants.) The quality and depth of material presented during the conference certainly showed a maturing nuclear energy industry. Most of the papers were concerned with state-of-the-art, concentrating on the physics and math aspects of nuclear energy. There was only very limited coverage of nuclear rocket activities. This was possibly a consequence of the AIAA meeting which was held in Cleveland at the same time and which afforded substantially more coverage in the nuclear rocket area.

During the session I chaired, Dr. Glen Graves, a physicist at the Los Alamos Scientific Laboratory gave an excellent talk on Rover program accomplishments. Dr. Graves has been working on Rover for a number of years. Two of the papers scheduled for presentation at my session by Aeroject, Sacramento, personnel, were not given. At the last minute, Nerva Program Office approval was not received; a question of premature information release may have been involved.

My overall impression of the conference was that both Canadians and Americans are knowledgeable of each other's work. There seems to be considerable coordination and cooperation between the nuclear scientists and engineers of the two countries. There also appeared to be an increased interest in fast breeder reactor development work, far more so than in previous meetings I have attended.

advance cy to Teir 7-8-68

URGENT

Bill Teir

This was not brought out in the DCR. Why not? B

NOTES 7/8/68 GEISSLER

B 7/9

1. Venting of the S-IVB Hydrogen Tank in Flight: As a result of activities to verify the structural integrity of the S-IVB propellant tanks, the DCR Board decided recently to reduce the ullage pressure of the LH_2 - tank by 4 psi on S-IVB/IB, and by 2 psi on S-IVB/V (see e.g., Weekly Notes 5/27/68 Teir, copy attached). These pressure reductions require the venting of $\leq$ 0.094 lbs/sec of gaseous hydrogen throughout the first stage flight. This decision to vent breaks our previous safety ground rule of "No hydrogen venting during first stage flight." Our primary concern is to prevent the occurrence of a detonable hydrogen - air mixture in the S-IVB tank cluster; heat transfer from burning hydrogen is our secondary concern. Conservative estimates of the vent flow dissipation were based on extrapolation of a few data points scrounged from the literature. They show that with flow rates of this low magnitude detonable mixtures stay a safe distance away from the S-IB tank cluster. Potential heat transfer increases are presently being investigated; no serious effects are expected. Since our ground rule is now yielding, a thorough experimental investigation of vent flow dissipation becomes mandatory. A test program is being prepared.

SIB?

2. Saturn V Real Time Target Update: This subject, recently discussed in the Flight Mechanics Panel (FMP) was reported in Notes 6/3/68 Geissler (copy attached). Since then, MSC has been trying hard to get this capability into the launch vehicle. In fact, at the last Guidance and Performance Subpanel Meeting, Mr. Kraft (MSC-Flight Operations Division) and Mr. Mayer (MSC-Mission Planning Analysis Division) both urgently requested that MSFC pursue this subject with greater emphasis. Consequently, a newly formed sub-group of the FMP will compile a story about the launch vehicle's capability of accepting new targets in real time, determine requirements for verifying in real time that the launch vehicle can fly (i.e., from control and stability viewpoint, etc.) with the new target, and study schedule and resources impact of incorporating this capability into the launch vehicle. We feel that this subject is sufficiently important to divert manpower to it at the expense of other projects.

Lee James

This sounds like a major add-on to the Sat V requirements list. Has Phillips approved all this? B

3. Effects of Unsteady Oscillating Shocks Prior to and at the Time of SLA Failure on AS-502: A rough but conservative estimate was made of the unsteady aerodynamic loads at 120, 125, and 133 seconds flight time. These loads develop because an adverse pressure gradient is created due to the airflow, exhaust plume interaction. A separated flow region (starting at approximately 105 seconds) and its attendant oscillating shock front develops over the aft portion of the vehicle. The upper limits of the induced bending moments due to the unsteady aerodynamic flow for AS-502 were computed for the SLA station at which structural failure occurred. The results indicate that the unsteady aerodynamic loads produced dynamic bending moments which were unimportant compared to flight measured loads or the stated load capability at the SLA failure region. Since the oscillations of the shock are believed to be caused primarily by thrust oscillations, suppression of POGO phenomena will further reduce those shock oscillations. An intensive effort is underway in our Laboratory to evaluate the coupled longitudinal, LEM, POGO induced oscillations and the resultant dynamic loads on the SLA structure. A more detailed report of the results of these studies is in preparation.

NOTES 7-8-68 GRAU

B 7/9

MODIFICATION AND VALIDATION EVALUATION (MAVE) OF SA-205/-503: Reference NOTES 6-24-68 GRAU (copy attached).

a. IO and this Laboratory are jointly preparing letters to prime contractors for your signature. The letters will direct attention to MAVE and encourage the primes to further their efforts.

b. At the present time there is no indication that launch schedules will be involved. ✓

ATTACHMENT: NOTES 6-24-68 GRAU (Dr. von Braun's and Mr. Weidner's copies only)

B 7/9

NOTES 7/8/68 HAEUSSERMANN

Lee James
Do you know of this?
B

1. Saturn/Apollo 503. R-ASTR-I was asked by MSC if they could transmit, via IU telemetry, measurements from the SLA area of AS-503 with BP-30 payload. The requirements are different from the recent exercise for AS-503 manned. The problem is being worked pending request through program channels. This would be the third full iteration on 503.

2. ATM Experiment Coordination Meeting. The next Experiment Coordination Meeting with the PI's was scheduled for July 16 and 17 at MSC. The plans included a tour and discussion of the Mission Control Center and the related operations. MSC decided last week against the mission operation discussion at this time and, therefore, the meeting will be held at MSFC. Items of the agenda include: cluster configuration, timelines and sequence of operations, tape recorder utilization and fine sun sensor operation and test program. Dr. Leinback of ESSA will present the ground based support plans for ATM.

OK the

B-7/9

NOTES 7/8/68 HEIMBURG

1. S-II STRUCTURAL TEST STAND The S-II (V7-21) stage structural test, Phase IIA, was successfully accomplished on July 5, 1968. R-QUAL completed dye-penetrant check of all welds except inside the lox tank on July 7, 1968. Phase IIB test will be in about 10 days.

2. F-1 ENGINE (POGO TESTS) Work continued on the installation of the lox interconnect pulsing system for the West Area F-1 Test Stand. The first pulsing test is scheduled sometime this week.

3. ACCESS ARM (No. 9) TESTING Completed arm rotation tests with aiding and retarding wind environments which completes all subsystem tests. System tests start tomorrow with test program completion scheduled the first part of August. Testing is progressing satisfactorily although we are encountering some of the same problems that we have experienced previously. These are aggravating, but solvable without major redesign.

4. S-IB (MSFC) A propellant load test was performed on July 3, 1968. The test was successful and all systems operated as expected. A short duration test, SA-55, is scheduled for July 10, 1968.

5. APOLLO TELESCOPE MOUNT Testing on the chain drive assembly has been stopped due to a problem with the test fixture drive mechanism. This problem has been discussed with R-ASTR and the test fixture drive mechanism is being modified.

NOTES 7-8-68 HOELZER

B 7/9

LOW-COST GRAPHICS COMPUTER TERMINAL: A low-cost graphics computer terminal developed under the auspices of the AMTRAN project is nearing operational status. The terminal consists of a keyboard/scope console and an electronic interface to connect to an IBM 1130 computer. (The 1130 is satellited via a voice grade phone line to the Burroughs 5500 computer located in Building 4663). The console contains a keyboard and a cathode ray scope and costs about $4500. The electronic interface costs approximately the same amount. Additional consoles should be available at a somewhat lower price.

The advantages of such consoles lie in their ability to display charts and graphical images and in their ability to display printed information at 20 times the speed of a teletype. The scopes will display a full typewritten page (about 3000 character positions) at a time. A $1200 photostatic copier is under development by the scope manufacturer to provide hard-copy output from the scopes (though this is not ready for marketing).

Since these terminals are much less expensive than commercially available vector displays, this development might render economically feasible the widespread distribution of such graphic terminals within the Center for applications such as, text editing, management information display, and engineering problem solving.

NOTES 7-8-68 JAMES

B-7/9

1. AS-503 Flight Program: In last week's notes we indicated the astronauts would have to change the LM atmosphere from nitrogen (at liftoff) to oxygen prior to spacecraft separation and that this could affect the flight programs. We have subsequently met with MSC representatives and they indicated they have 90% confidence that the astronauts can accomplish the atmosphere change and extract the LM prior to the time we've planned the first restart of the S-IVB stage. We are requesting confirmation from George Low as this will avoid all changes to our flight programs. If during the actual mission the astronauts do not accomplish their work in the time allowed, MSC will have to make a real time decision to delay the S-IVB restart for one orbit. This would cause the loss of the 80-minute restart demonstration.

2. AS-503 Open Work: A workload review meeting was conducted at KSC on July 3 with MSF, MSC, MSFC and KSC present. The meeting was called by MSF after KSC statements that changes on AS-503, 504 and 505 planned for KSC were limiting the KSC ability to meet launch schedules. During the review of planned changes, two changes on the S-II (thrust structure modification and insulation doubler changeout) and the S-IVB-504 instrumentation package were discussed as possible deletions or reductions. MSFC recommended to MSF that the three changes be incorporated since the spacecraft now appears to be pacing the AS-503 launch and the confidence in the launch vehicle will be enhanced. KSC agreed with the MSFC position and MSF intends to provide an answer on the three changes on Monday, July 8. It is clear that KSC will have serious schedule problems unless the strongest possible change control is exercised by all three centers.

3. Short Stack Structural Testing (Wyle Lab/Huntsville): The delivery dates for Saturn hardware (the S-IVB forward skirt and IU) in support of this testing are on schedule based upon overtime and expediting.
Dr. Lanzkron's meeting on Tuesday, 2 July 68, revealed that Wyle is not necessarily expecting to be able to stack the pieces on 15 July. Wyle mentioned a date more like 1 August to start stacking. MSC, however, is sticking to the requirement of 14 July 68 delivery and will reconfirm the delivery requirements on Tuesday, 9 July 68.

Order of replacement hardware (two S-IVB forward skirts and two IU structures) being expedited -- rough order magnitude costs total approximately 3/4 million.

4. POGO Management Review: The proposed agenda for the 15 July POGO Management Review (LDX teleconference) with the Centers and Washington is being furnished for Washington approval on Monday, 8 July. A copy of this agenda is attached (Dr. von Braun's copy only).

NOTES 7/8/68 JOHNSON

B 7/8

Nothing of significance to report.

NOTES 7-8-68 KUERS

B 7/9

1. Neutral Buoyancy: A study of the first concept for the MDA internal mobility aid was completed. Astronaut P. J. Weitz of MSC participated in the test. Testing on Concept 2 will begin this week.

2. Conference: The Manufacturing Engineering Laboratory is preparing a display and a film for use at the second annual conference on Extra Vehicular Activities to be held August 6-8 in Las Vegas. The items to be displayed are: a model of the Electron Beam Space Welding Experiment; a Window Cutting and Assembly Device; Hand Driven as well as Motorized Tools for Assembly, Maintenance, and Repair in Space; Electrostatic Grippers; and an Adhesive Bonding Gun for attaching studs. The space tools, electrostatic grippers, and stud bonding will be demonstrated during the meeting. The film is on the Serpentuator.

NOTES 7-8-68 LUCAS

B-7/9

1. POGO: The next full meeting of the POGO Working Group is scheduled for July 10, 11, 1968. Splinter meetings among specialists in the various technical areas will occur on 7-10-68 and 7-11-68 will be devoted to summarizing the status of POGO activities and preparing for the management review (LDX) on 7-15-68. Two pulsing tests (C-006-86 and C-006-87) were run 6-28-68 and one test (C-006-88) was run 6-29-68 on the F-1 Bobtail Stand. This completes the test program until 7-13-68 since S-IB-12 will occupy the blockhouse during this period.

B.L. Have we now made a hard proposal to develop the hardware for M-050 to check Berry? B

2. AAP MDA BASELINE DECISIONS: Reference Notes 6-24-68. Proper nomenclature of M-050 is "Metabolic Costs of In-flight Tasks." The hardware consists of: (a) Metabolic analyzer (CO_2); (b) Bicycle Ergometer; (c) Vest and Harness Assembly (pulse, heartrate, voltage measurements); (d) Work Task Boards; and (e) Face mask and hose. The experiment will assess the process of metabolism as a function of work in the environment of the Orbital Workshop.

3. ORBITAL WORKSHOP (OWS): The continuing Cluster power shortage and weight problems have led to continual studies of active thermal control concepts. Pending a favorable answer (expected) on 7-15-68 from McDonnell Douglas Company relative to studies for increasing Airlock radiator size and heat exchanger numbers, the system looks promising because of insensitiveness to important parameters, power saving of 1 Kw, significant weight reductions and potential large dollar savings.

4. "B" STRUCTURE TEST (401) (UPPER PORTION OF LH_2 TANK AND FORWARD INTERSTAGE): On 7-3-68, the "B" structure test for ultimate max Q-α loads was aborted due to the inability to retain internal pressure in the forward skirt cavity above 3 psig (test goal was 8.8 psig). In addition to the excessive skirt pressure leakage, one of the stringers adjacent to the access door was indicating stress levels of approximately 90% of estimated capability. Considering the interaction of body loads and internal pressure in the skirt and the forward LH_2 tank, the maximum calculated safety factor achieved was 1.19 compared to a required 1.30. Loads used for this test phase were based on the specific AS-504 flight predicted environments which are less severe than the loads used originally to design the lightweight S-II. A fix may be required to assure safe completion of this test phase. Additional strain gages will be installed around the access door prior to retest to closely monitor the stress distribution. Tentative planning (not including the fix) is to initiate retesting 7-12-68.

Eberhard R. This sounds disconcerting. Please look into it B

5. "A" STRUCTURE TEST (402) (LOX TANK AND LOWER PORTION OF LH_2 TANK): The first test on the "A" structure was completed successfully on 7-5-68. The test consisted of the pneumostatic test (35 psig in the LH_2 tank and 62 psig in the LOX tank) and an additional reverse bending test on the common bulkhead during pressure reduction. This test was scheduled to start 6-19-68 but continual problems with the data acquisition system prevented testing. The problems resulted from a number of factors which were compounded by the sheer size of the system (4600 data channels). Exposure to weather, use of new and untried equipment and development and de-bugging of the computer programs also contributed to the delay. However, due to the complexity and hazardous nature of this test program, a sophisticated data system is necessary. A complete dye penetrant inspection will be accomplished immediately prior to testing with cryogens.

NOTES 7/8/68 MAUS

B 7/9

AAP INTERIM OPERATING PLAN ("MINI POP") - On May 31, Dr. Mueller requested MSFC to prepare an Interim Operating Plan (known as "Mini POP") for Apollo Applications Program Requirements through November 1968. This "Mini POP" call is considered necessary for OMSF to develop a total "baseline plan" of obligations for FY-68 and FY-69 of $506.4M. Of this amount Marshall's planned obligations through November 1968 are not to exceed $146.9M and the guideline for December 1968 through June 1969 is $100.0M. A Center review was held with Dr. Rees on July 5 and the plan will be submitted to Headquarters on July 8.

FISCAL YEAR 1969 AO & R&D SUPPORT CONTRACTORS OPERATING PLAN - We have also been requested by Dr. Mueller to develop a reduced FY-69 AO Program Operating Plan. This plan is essentially based on Plan II-A of recent Agency operating alternatives which requires a reduction of $17.1M at MSFC. Our plan, incorporating five detail analyses, is due at MSF on July 15, 1968.

MANAGEMENT STUDIES:

NATIONAL ACADEMY OF SCIENCES - Dr. Robert Guest (Dartmouth College), who is conducting a study of NASA management of complex technologies, visited MSFC June 24-28 to begin his field research. This study is being conducted under the auspices of the National Academy of Sciences with Dr. Leonard Sayles (Columbia University), as Project Director. Dr. Guest is concentrating on the ATM project and will spend two additional weeks at MSFC beginning July 8, 1968.

SYRACUSE UNIVERSITY - Drs. Bernard Wood and Eugene Drucker, members of an interdisciplinary research team from Syracuse University, visited MSFC June 27-28. They are conducting research into the management of major NASA programs under a NASA Headquarters grant recently approved by Mr. Webb. They plan to concentrate on the Apollo Program.

B 7/9

NOTES 7/8/68 RICHARD

No submission this week.

F.S.

I wish they had one for Alabama highways !!

B

B 7/9

NOTES 7-8-68 SPEER

1. Lunar Debris: Headquarters (Schneider) is formulating a lunar debris policy for the Apollo Program. MSFC has been requested to recommend positions relative to S-IVB/IU-Spacecraft recontact and the control of lunar debris. MSC is also to recommend a position on control of lunar debris and address the associated lunar orbital problems. We are working this request with the Saturn V Program Office and R&DO.

2. KSC ALSEP Ground Control Proposal: Reference your questions to Notes 6-24-68 Speer, subject: ALSEP (copy attached). The two MSFC computers that KSC utilized in their proposal are Univac 930's of which MSFC presently has four. Two of these are Government owned and the other two are leased. MSFC plans to return the leased computers this Fall. The two Government owned 930's are now being used by R-ASTR and R-P&VE. R-COMP reassigned these computers as follows: one to R-TEST for ATM testing and one to R-ASTR for optical systems design.

3. AS-503 Laser Test: The laser precision optical tracking test is now scheduled in conjunction with the AS-503 launch to evaluate a laser-telescope radar system. This installation was disapproved for prior launches on the basis of not being mandatory. Installation of the reflector mount on the LUT at the IU level has now been completed by KSC. A limited test was conducted during the AS-502 launch with the reflector mounted on a nearby calibration pole instead of the LUT, and data for determining launch vibration environment effects on the test were obtained. Laser can potentially provide a very accurate tracking system during initial launch phase (for crew abort and range safety aspects) as well as AAP orbital use.

4. HOSC Orbital Data: We were notified by MSC some time ago that there was a potential problem in the continued relay of realtime orbital launch vehicle data from the Mission Control Center to CIF and HOSC. The problem arises on AS-504 and subsequent when two separate remote site data lines are used for launch vehicle and spacecraft data, rather than one line being shared as in the past. The resulting increase in the amount of realtime launch vehicle data creates a problem with the data formatting system used in the MCC-CIF relay. The potential effect was that only about half of the launch vehicle data would reach CIF and the HOSC. We have now determined with KSC that the necessary decommutation will be provided at CIF and have requested MSC to continue transmitting the entire data stream to us.

NOTES 7-8-68 Stuhlinger

B 7/3

No submission this week.

B 7/9

NOTES 7/8/68 TEIR

CSM 101 DELTA DESIGN CERTIFICATION REVIEW: Subject DCR will be held on Wednesday, July 10, 1968, at MSC. MSFC's participation in the DCR will be primarily two presentations to the DCR Board: Jim Sterrett, R-P&VE-S, will give the presentation on the AS-205 Space Vehicle Oscillation Study, and Dick Smith, R-SE, will give the presentation on AS-205 interlocks. A final dry run of the interlock presentation will be at 11:00 AM, Tuesday, July 9, in the Saturn IB Control Room. Bill Schneider, NASA Headquarters, the Apollo 7 Mission Director, will sit in on this dry run. ✓

noted 8/7/68

S-IVB STAGE PROPELLANT UTILIZATION (P.U. SYSTEM): At this time the S-IVB Stage P.U. System may present the major scheduling problem for SA-205 from the launch vehicle viewpoint. Following the AS-502 P.U. Probe Anomaly, both McDonnell - Douglas and the R&DO laboratories were given the job of evaluating the failures and developing recommended actions. Although MDC has recommended we fly the P.U. System closed loop, as we have in the past, I understand Astrionics recommendations will be to fly the system open loop (which requires both a hardware change and software changes). The hardware change is relatively small and can be accommodated. The software change would require a change to the Flight Program sufficiently large to require a delivery of an updated program 1 to 2 weeks (based on the present schedule) after the final Flight Program Level I milestone delivery date of 6 weeks prior to launch. Flying the system open loop also has the disadvantage of reducing the flight performance reserve below the 3 sigma level somewhere in the 2.5 sigma range. The argument is that this change will give us the greatest overall probability of accomplishing the mission with a satisfactory orbit. We are having a meeting today at 10:00 AM with the objective of making our program level disposition of this change. ✓

Kaller Haussermann

We shouldn't seek the easy way out, after the money we've spent. Moreover, we'll need the payload only attainable with P.U. for the lunar Sat V missions anyway. Please lay on a positive plan to get the P.U. back on stream. This has a higher priority than all AAP projects. (205 may be an acceptable exception)

B

S-IB STAGE STORAGE ENCLOSURES: Technical Services Office has completed fabrication of the storage enclosures, air conditioning ducts and temperature/humidity control panels for storage of S-IB stages. The seventh (last) enclosure air conditioning ducting and controls were shipped to CCSD/MAF on July 1. The method of handling this type of work inhouse when facilities are available and furnishing the finished product to the prime contractor is considerably superior from both a schedule and dollar viewpoint to contracting this type of work with the prime contractor. This has been demonstrated by comparing the status of the S-IVB storage enclosure work contracted with MDC against the S-IB storage work by the Technical Services Office. The latter should be congratulated. S-IB-8 will be the first stage to go into an operational enclosure (about mid-July). ✓

B.T.
Please prepare suitable letter for my signature
B

Bill Teir
Xerox copy for info.

B 7/9

NOTES 7/8/68 WILLIAMS

Negative

July 15, 1968

9-26-

With comments

Maus notes w/o Braun comment

to Mr Gorman.

* STAFF LUNCHEON — WEDNESDAY 24 JULY
MR. GORMAN WILL DISCUSS.

NOTES 7/15/68 MAUS B 7/18
7/17 KS

ADMINISTRATIVE OPERATIONS SUPPLEMENTAL POP 68-2 - The Administrative Operations Supplemental POP 68-2 was reviewed with Mr. Gorman on July 12 and forwarded to Headquarters. The submission reflects our plans within a $108,600,000 ceiling for FY-69, and the 5981 Civil Service personnel ceiling established in Dr. Mueller's teletype, dated June 28, 1968.

A comparison of our original POP 68-2 requirements to POP 68-2 supplemental is shown below: ($ In Thousands)

FUND SOURCE	ORIGINAL POP 68-2 REQUIREMENTS	△	POP 68-2 SUPPLEMENTAL
Personal Services (F/S-1)	88,120	3,061	85,059
Travel (F/S-2)	2,973	773	2,200
Operation of Installation (F/S-3)	28,178	6,837	21,341
TOTAL	119,271	10,671	108,600

I Harry S. I'm very curious about your proposed ordering on this subject. * B

ATTRITION TAX - At Mr. Gorman's request, we are checking into possible approaches which the Center might take in coping with the 1 out of 4 replacement formula to achieve a Center ceiling reduction of 459 spaces.

In order to reduce by that number and apply the 1 for 4 formula, the Center must attrit 612 people. This permits outside replacement of only 153. Based upon attrition history, we can reasonably expect approximately 50% or 300 of our total attrition to occur in the clerical skill. This indicates that most of our replacement capability of 153 will be expended in hiring replacements for half of our clerical losses. It becomes evident then that other vacancies will have to be filled from within. Once that is recognized there then arises a need for some method to assure that internal reassignments which do occur involve the movement of personnel from less to more essential functions of the Center rather than in the opposite direction. This problem was presented to the Salary and Wage Committee on July 12 where it was determined that a method of ranking Center functions in terms of essentiality is needed. We are pursuing the development of such a method, which will be implemented as soon as possible.

I.D. weekly notes 7/15

Jack B.

This incident indicates that the procedures at the SII complex need some tightening. Please set up a suitable review with GE/NR et al. 7/17 B

B 7/18

NOTES 7/15/68 BALCH

S-II-5 - on 7/11/68, while fuel ducts were pressurized to 30 psi, a power failure in the S-II complex occurred when lightning struck the sub-station power line. The emergency battery power source failed to energize because the transfer switch was in the maintenance mode. With no power, the recirculation valves opened allowing the LH_2 pumps to be spun backwards. After running special tests, it has been determined that the LH_2 pumps must be replaced. No impact is expected on static firing, which is still scheduled for 7/23/68.

S-II-6 - Stage contractor's local schedule still calls for cryogenic proof pressure test on 8/22/68, but it is anticipated that this date may be changed to 9/4/68 based on current scheduling activities being conducted by the stage contractor and the MSFC Stage Office.

S-IC-6 - POGO-modified LOX prevalves have been installed. However, it was necessary to replace a seal on the LOX prevalve for Engine No. 5 because of leakage, and this caused the propellant load test to be rescheduled from 7/12/68 to 7/16/68.

(We may have lost a engine. Was just plain luck that we didn't.) B

Protest of Award of GE Subcontract - A formal protest has been filed by Allied-Webb as a result of the award by General Electric of Subcontract 081-4-74223 for Installation, Repair, and Alterations at MTF to Management Services, Incorporated. The General Accounting Office, upon being furnished a copy of the protest by Allied-Webb, requested of NASA Headquarters a complete report and file on the award. NASA Headquarters requested of MSFC a fully documented report by 7/19/68 for use as a basis for a response to General Accounting Office. This report is being prepared at MTF for forwarding this week.

Labor Relations - Approximately 30 members of various Craft Unions employed by Management Services, Inc., left their jobs about 10:00 a.m., 7/10/68, in protest of the handling and warehousing of construction materials and supplies by General Electric and a change in the level of servicing of equipment assigned to this subcontractor as a result of the assumption by General Services Administration of a portion of the motor pool at MTF. All employees involved in the work stoppage had returned to their jobs this morning, and there was no significant impact on MTF operations or schedules.

Public Affairs - During the first half of this year, there has been an increase of 6,000 visitors over the corresponding period last year. The number of foreign visitors increased from 246 during the first half of last year to 719 during the first half of this year.

NOTES 7/15/68 BELEW

B 7/18

7/17/68

COMMONALTY OF THE LM-A AND A LUNAR MODULE CARRIER FOR LUNAR MISSIONS: John Hodge, who is heading up MSC's Advance Lunar Exploration Office, will be at MSFC on July 17, to discuss the follow-on lunar effort on rolling vehicles and carriers with Frank Williams and others. One area which will be covered is the commonalty between the LM-A modifications for the ATM mission and an unmanned LM ascent stage to carry lunar surface payloads. We will brief Frank Williams' office on LM-A to help further define minimum modifications to the Apollo LM for follow-on lunar surface activities.

CONTROL MOMENT GYROS (CMG's) VERSUS BIPROPELLANT SYSTEM FOR SATURN I WORKSHOP: As a result of some questions by Dr. Mueller, Mr. Disher asked Bellcomm to reevaluate the feasibility of CMG's as opposed to a bipropellant control system for the Workshop mission. This same question was asked of MSFC by Chuck Mathews in 1967. Bellcomm was contacted and requested to discuss their most recent analysis of the subject prior to getting back with Dr. Mueller. George Anderson and one of his associates visited MSFC on July 12, to discuss this matter. Bellcomm stated they did not plan to conduct another analysis but will reconstruct the circumstances which lead to Mathews asking the question initially (addition of AAP-3A into the program) and use MSFC's weight, power, and complexity tradeoff which was developed earlier. We reviewed these factors on July 12 and concluded that the earlier decision to proceed with a bipropellant system was still a valid one.

AAP BASELINE CONFIGURATION REVIEW: The AAP Baseline Configuration Review is scheduled for July 23-24 here at MSFC.

ATM NEUTRAL BUOYANCY (NB) TESTING: The Neutral Buoyancy test article is now scheduled for completion September 1, 1968. ME Lab is looking at the possibility of completing the article by August 15, 1968. This article will have only the modifications necessary to perform the translation studies. Work station modifications would not be made until translation testing is complete.

LM/ATM INDEXING: During the last EVA task team meeting, MSC indicated that they would recommend baselining ATM primary EVA through the LM front hatch and requested that MSFC study the possibility of indexing the LM so that the LM end work-station is within 45° of the LM hatch. This could be accomplished by rotating the LM or by relocating the work-station 90° or 180°. A study is being made to determine the most feasible way to accomplish this.

B 7/18

NOTES 7-15-68 BROWN

7/17 KA

GENERAL As a result of the J-2 ASI fuel line failures on AS-502, we are involved in an intensive evaluation of all fluid lines on the engines. R&DO, in conjunction with MSFC prime contractors, has established criteria for revalidation of Saturn systems flex lines. These criteria applied to the engines result in the requirement to reverify by testing one H-1 line, 21 F-1 lines and 16 J-2 lines in support of AS-205 and AS-503.

In the H-1 only the fuel bootstrap line requires flow testing at this time. The flow tests will be initiated and completed next week. The tests will be conducted at resonant flow conditions at 10 percent above and below the 3 sigma flow rates. The analysis of five other lines for possible flow testing will be completed by August 14.

The verification testing will include vacuum flow as applicable, thermal shock, flexure, vibration and proof pressure tests. In addition there are eight flexible lines on the J-2 engine that require formal qualification. Rocketdyne has been directed to expend maximum effort to perform qualification and reverify at least one sample of lines prior to the AS-205 flight and to complete the second set of reverification lines prior to the AS-503 flight. The revalidation of lines which are a constraint on 205 and 503 can be accomplished prior to the current launch dates, but in the case of four of the J-2 lines the work extends to mid-September. We are attempting to better this schedule but not much improvement is anticipated.

All applicable flexible lines on the F-1 engine have been assessed using the criteria developed as a result of the J-2 ASI line problem. Ten configuration lines have been identified with a combination of vendors totaling 21 bellows. Nineteen lines will be tested incorporating the 21 bellows and 10 configuration lines. Seventeen lines will be flow tested at resonant frequencies only. Two lines of the same configuration will be completely qualification tested.

In total we will reverify by testing more than 50 flex lines.

J-2 ENGINE During a routine leak check on engine J-2033 installed in AS-205 the gas generator fuel valve leaked beyond specification limits. The valve was removed and returned to Rocketdyne. The reworked valve is scheduled to be returned to KSC for installation July 17, 1968. No schedule impact is anticipated.

B 7/18

NOTES/7/15/68/CONSTAN

7/17 KB

A review was held at Michoud Assembly Facility on July 10, 1968, of the Saturn Vehicle Manufacturing Consolidation Study. This is in support of the Launch Vehicle Studies requested by Milton Rosen. The meeting was chaired by Dr. Rudolph and included a NASA Headquarters (Mr. C. T. Newman), and KSC (Mr. Siepert) representative. In addition to Mr. Newby and General O'Connor, laboratory, staff and program office personnel from MSFC were in attendance. ✓

NOTES 7/15/68 FELLOWS

7/17 RS

B 7/18

No submission this week.

NOTES 7/15/68 GEISSLER 7/17/68

B 7/18

1. AAP Plume Impingement Contamination Testing: A preliminary proposal for testing to determine surface contamination of the AAP cluster resulting from plume impingement has been presented to the Materials and the Propulsion Divisions of P&VE by our Aerophysics Division. This plan, developed in response to a request from P&VE, integrates the Air Force MOL contamination and the MSFC AAP contamination testing and provides for a possible integration of AAP contamination testing for MSC. The series of tests, which would cost approximately $700,000, would be done at the AEDC facilities in Tullahoma between now and next July. P&VE is presently reviewing our proposed plan and investigating the possibility of funding the testing. Our Aerophysics Division is continuing to investigate the testing plans. ✓

2. World Wide Cloud Cover Study: Representatives of Manned Spacecraft Center plan to use results of our world wide cloud cover study to determine landmark sighting probabilities for mission AS-205. We have received an urgent request from MSC for several copies of the final report which is presently being printed for distribution as a NASA Contractor Report. ✓

3. Reduction in S-IC-3 Cutoff Acceleration: MSFC was requested by Mr. Low, MSC on July 8, 1968, to cutoff the S-IC center engine early on AS-503 and subsequent Saturn V flights in order to reduce the "g" loads at end of boost to a three sigma value of 4.0. This will prevent the need for a structural beef-up and ground retest by MSC. At the request of Mr. James, this change was analyzed by R&DO for 503 and the decision was made to implement on 503 a center engine cutoff at T_1 + 125.2 (10 seconds earlier) and proceed with software changes immediately. This will cause the S-IC to burn 2 to 3 seconds longer and shift orbital insertion 1 to 2 seconds later. There will be a decrease in amount of propellants for the dump experiment from 7000 to 5500 pounds. Preliminary results indicate an approximate payload loss of 500 pounds, however, we are not payload critical on 503. An assessment is being made of the payload loss which will result from implementing this requirement to guarantee a first stage acceleration below 4.0 g's on AS-505 and 506.

E.G. Is there no base heating problem associated with this earlier center engine cut-off? B

4. The 19th Congress of I.A.F: A paper by Mr. Hugo Ingram of our Astrodynamics and Guidance Theory Division, has been accepted for presentation at the 19th Congress of the International Astronautical Federation. The Congress will be held in New York on October 13 - 19, 1968. The topic to be presented by Mr. Ingram is entitled, "Optimal Guidance with Transition Partial Derivative Matrices." ✓

NOTES 7-15-68 GRAU

B 7/18

7/17 TS

1. J-2 ENGINE-TO-STAGE ATTACH BOLTS: With regard to Dr. Lucas' note of 6-17-68 (copy attached) on J-2 engine-to-stage attach bolts, the following is the status. The MDC engine installation drawing shows that lubrication is required. An improper torque value was specified, this has now been corrected and the proper value incorporated into the MDC drawing. We have verified that all stage contractors and/or Government Agencies have mandatory inspection points for lubrication and torquing of engine attach bolts.

2. SWING ARM MODIFICATION: This Laboratory will provide facilities to Boeing for swing arm modification. Boeing facility requirements and swing arm modification schedules presently conflict with the MDA checkout facility requirements and schedule; however, we are working with Boeing to arrive at a mutually acceptable method of accommodating both requirements.

NOTES 6-17-68 LUCAS B 6/25

1. POGO MANAGEMENT REVIEW: POGO Management Review is scheduled on 6-18-68 using the Boeing TIE network facilities. A dry run of MSFC's portion of the presentation will be conducted this afternoon, building 4610, room 5045. Final coordination of the POGO test schedule and events logic diagram has been completed between MSFC and MSC. The schedule and event logic diagram will be maintained at both Centers and Headquarters by the Boeing TIE organization. Lack of test data for the 8-8-68 DCR continues to be a schedule problem. Discussions with Headquarters have not relieved this schedule incompatibility. A preliminary POGO analysis of the AS-205 has been completed with updated POGO model including damping from dynamic test results. Results show the vehicle to be very stable in first mode with second mode showing marginal stability during the last second of first stage flight. ✓

2. J-2 ENGINE-TO-STAGE ATTACH BOLTS: One of the six engine attach bolts on stage S-IVB-506 was found to have a thread failure; MDC conducted tests and analyses to determine the cause of the failure. The results show that the bolt threads yield due to an excessive torque. (Specification based on dry bolts and bolts were installed with lubrication.) MDC assumes bolts on all stages yielded. These bolts will be replaced with lower torque requirements at the time the redesigned ASI fuel lines are installed. ✓

3. IU CRACKED SLEEVE: A cracked 7075-T6 sleeve was found in a component removed from IU 501 for some other purpose. The sleeve was procured from Teledyne under a specification requirement for 7075-T73, however, the sleeve was not in this temper. We are informed that this sleeve was one of approximately 50 purchased by IBM from a production lot of approximately 1700. Of the 50 sleeves, 25 were shipped to KSC as spares. R-QUAL is presently checking where these are. ✓

4. ORBITAL WORKSHOP (OWS) SOLAR ARRAYS: At the direction of I-S/AA, we have initiated a feasibility study to increase the size of the Solar Arrays from the present 1200 ft^2 to 1600 ft^2 area. A minimum weight approach is to be followed, which excludes the use of the present ATM modules. Each wing will carry 14 panels instead of the present 10 panels. We are trying to incorporate this increase without changing the beam fairing. The baseline solar array development will probably slip as a result of the requirement to look at an entirely new system. Unfortunately, the whole matter of AAP's actual power requirements is still in a state of flux. ✓

5. AS-205 PULL TEST: The AS-205 pull test was completed on 6-10-68. A quick look at the data indicates that load distribution for the center LOX tank and the outer LOX tanks differ by approximately 40% from AS-204. This difference is partially explainable by modifications to the S-IB forward skirt and a slightly different direction of pull. A complete assessment will be made upon receipt of the data tape from KSC. ✓

6. S-IVB/IB RETROMOTOR IGNITERS: The motors presently planned for use on SA-205 have igniters that will have exceeded the two-year shelf life limitation. Thiokol has agreed to submit justification to support a recommendation that the igniter shelf life be extended to three years. We will review with MDC on 6-18-68. ✓

(2) Suggest you ask Haus to have a review on the possible effect of this oversight (dry vs lubricated torque not clearly defined in specs) on other elements of the Saturn program. Spacecraft and GSE may be affected, too. B

NOTES 7/15/68 HAEUSSERMANN

7/17 9AS

B 7/18

1. ATM Facilities. NASA Headquarters has been holding up the authorization for the ATM clean rooms in the ME and QUAL Laboratories and the Astrionics Laboratory facility modifications for the efforts related to the Goddard X-ray telescope and the fine sun sensor. Headquarters has requested an impact study based on project approval by September 1, 1968 for the ME Laboratory facility. One present assessment is that the schedules will slip and we will try to resolve these problem areas with IO and Headquarters. ✓

2. Attitude Control of the S-IVB Workshop. The question of the possible use of control moment gyros rather than an auxiliary propulsion system (APS) for attitude control of the S-IVB workshop has been repeatedly raised from NASA Headquarters. The most recent assessment of the matter was presented to Dr. Mueller at MSFC on February 23, 1968 and to Mr. Mathews in Washington on February 27, 1968. Subsequent to the presentations, MSFC was given authorization to proceed with the development of the APS system. As a result, the CMG approach has been dropped from further consideration. Within the past two weeks, Dr. Mueller has again asked why CMG's are not being utilized, Bellcomm has been assigned the task of preparing another presentation to again answer the question. Mr. Anderson and Mr. Kranton of Bellcomm visited MSFC on July 12, 1968 to discuss the matter. The considerations are still the same as they have been in each of the previous assessments. The workshop attitude control problem does not justify the complexity of a control moment gyro system. In addition, the CMG system must be supplemented by a bi-propellant or cold gas propulsion system for stabilization during docking. The incorporation of a cold gas system introduces a significant weight penalty while the use of CMG's plus a bi-propellant APS system shows a significant cost disadvantage and adds complexity to the total system.

3. Professor Letov's request to be permitted to participate on this year's AIAA Guidance and Control Conference has been disapproved by the State Department. Reasons given don't look to me to be the real ones. ✓

URGENT

5H.

Since FEM has raised the same question with me again a few days ago, I'd like to have a 1-hr briefing on all aspects of this question. Please arrange with Jim Shepherd

B

B 7/18

NOTES 7/15/68 HEIMBURG
7/17 KS

S-II STRUCTURAL TEST PROGRAM The S-II (V7-21) Stage Structural Test, Phase IIB, is scheduled to begin at 9 a.m. July 15, 1968.

F-1 TURBOPUMP -POGO We plan to resume POGO testing at the F-1 Turbopump Facility on July 16. Testing should continue through August on the test program which we received from P&VE last week. Turbopump testing has been inactive since June 29, to allow P&VE time to review the test data and to keep from interfering with the static tests on S-IB-12.

ARM 9 TESTING Test activities were a minimum this past week as most of the time was taken by Boeing installing modifications in the control console. System testing started yesterday. KSC personnel (Middleton and Buchanan) are expected tomorrow to discuss deliveries of other Arm 9 hardware to KSC (9 - Flow 1 and 9 - Flow 2 - Arm presently in test is 9 - Flow 3). As of now, we are not on the Critical Path.

S-IVB-506 (SACTO) The planned propellant loading of S-IVB-506 was conducted on July 11, 1968. The test was terminated prior to completing the sequence, however, the loading will not be repeated since the majority of the objectives were completed and the cause of abort has been determined and fixed. The firing is still scheduled for July 17, 1968.

K.H. Please see also my remarks to Bold's NOTES 7/15/68. Please be helpful in setting up that review B

S-II-505 (MTF) Firing Readiness Review is scheduled July 15, 1968, at MTF. The acceptance firing is now scheduled for July 23. All 10 LH_2 lox recirculation valves have been removed and returned to Seal Beach for inspection due to QUAL test failure. Replacement valves are being installed.

F-1 ENGINE Tests FW-091 through FW-095 were conducted on the West Area F-1 Test Stand on July 11 and 12, 1968, with F-1 engine S/N F-2009-1. Primary test objective was to evaluate the lox prevalve accumulator POGO fix utilizing the lox interconnect pulsing system. Data from these tests are being evaluated.

S-IB (MSFC) Test SA-55 was conducted on stage S-IB-12 on July 10, 1968. The test was terminated after 35 seconds, upon completion of scheduled duration. The test was successful and all stage systems functioned normally. Test SA-56 is scheduled for July 25, 1968.

MOBILITY TEST ARTICLE Preparations were made to start the road tests. These tests are scheduled to begin the week of July 15, 1968, if weather permits. The purpose of the MTA is to develop design data for the Lunar Surface Survey Module (LSSM).

B 7/18

NOTES 7-15-68 HOELZER

7/17 9 TS

NEGATIVE REPORT.

NOTES 7-15-68 JAMES

B 7/18

7/17 WS

1. POGO: The full POGO Working Group met at MSFC Wednesday and Thursday, June 10 and 11. A review of all the data indicates that the LOX pre-valve accumulator method of dampening appears to be the better method of eliminating POGO from the Saturn V vehicle. A presentation on the findings will be given to General Phillips, MSC, and KSC on Monday, July 15, via Boeing TELECON (Boeing Research Park). We expect to receive a firm go-ahead from General Phillips at the end of the TELECON. Gen Phillips approved the LOX pre-valve accumulator method. Kits are at KSC - The system will be tested on S IC-6 at MTF in early August WS 7/18 The delivery date for the IU stage, which will be used in the short stack structural testing, has been changed from 14 July to 4 August; however, a new requirement was identified - mass simulation for components. This requires an immediate investigation of what is available and what has to be manufactured for that purpose.

2. ASI Lines: The S-II battleship was successfully fired for 93 and 344 second durations on July 9 and 10 respectively. Both tests were terminated by LOX depletion as programmed. Quick-look data indicates the ASI lines and redesigned LOX sump screen are performing as desired.

3. Saturn V Filter and Contamination Investigation: Some time ago we initiated a study with the laboratories to determine if additional fluid filters were needed in the GSE or on the vehicle to prevent contamination. The laboratories' review indicates the filters currently in the system are quite adequate for the task. The main problem found with contamination is one of human error in allowing contamination to be introduced into the system through open lines.

4. Retest of IU-504 Stage: As we mentioned in our notes a couple of weeks ago, MSF has approved a delay in shipment dates for the AS-504 stages, and we were taking advantage of this to incorporate all modifications and retesting practical prior to shipment. We have met with IBM and have worked out a method whereby all currently identified modifications on the IU-504 stage will be installed at Huntsville and all necessary retesting and verification accomplished prior to the shipment date.

5. Failure of S-II Stage Lightweight Structural Test Article ("B" Structure): A failure occurred on July 12 in the forward skirt of the S-II lightweight test article at Santa Susana. The skirt failed at maximum Q alpha loads with the tank at ultimate pressure and the internal skirt pressure at 7.8 psid compared to the maximum planned pressure of 8.8 psid. The failure occurred longitudinally and damaged the forward skirt and SIVB aft interstage. The LH_2 tank did not rupture. Investigation is underway to determine the cause of failure, its implications and the possibility of repairing the structure to continue with the remaining ultimate test conditions.

NOTES 7/15/68 JOHNSON

7/17 RS

B 7/18

MSF - Supporting Development Program Quarterly Review - MSFC hosted the July Quarterly Review of the MSF - Supporting Development Program on July 9-10. Mr. Doug Lord and Dr. Eldon Hall of the MSF Advanced Manned Missions Program Office along with others from NASA Headquarters, MSC and KSC were in attendance. An executive session was held on July 9, with key Headquarters' and MSF Center personnel directly involved with Supporting Development to discuss management aspects of the program. The activities for July 10 consisted of visits to ME, QUAL, TEST, and P&VE Laboratories, where the visitors were briefed by the labs on several of their on-going Supporting Development projects. These presentations were very well made and most aptly illuminated MSFC's activities and capabilities in supporting research and development. ✓

Advanced Manned Mission Funding - The Center was advised by TWX on Friday (11 July) that a decision had been reached to reduce the Supporting Development Program (904, 905, 908) FY '69 funding level from $32M to $18.2M total. This results in a reduction of the Program from $13.5M to $7.5M. We are reworking the program to conform with this new guideline. The reduced funding level will seriously curtail and/or eliminate much of the work planned to obtain an applied research start on proposed future space station subsystems like the nuclear power systems, integrated thermal control systems, and integrated data management systems and techniques. It will probably seriously reduce the effort on the J2 simplified engine.

B.N. Request briefing on impact and reasons behind this cut B

Manufacturing In Orbit - In collaboration with ME, we are continuing to explore interests and ideas of other groups relative to this subject. During the week of July 8, two briefings were held:

- GD/C has investigated the composition of such a program and has submitted an unsolicited proposal. Conclusion: Their approach is broad in scope and too ambitious to consider in total. Some segments of the proposed efforts could be a part of the "specific process experiments" approach you outlined in our meeting with you in April. ✓

- Battelle representatives presented their views on space processes for crystal/whisker growth. Conclusion: Battelle is interested in this general area and is now doing a good bit of homework. ✓

Let's pursue this with vigor. There's plenty of potential in this.

As groups are contacted, the ME/EO team briefs them on the content and status of the MSFC program for the purpose of stimulating interest and familiarization so that they can respond effectively to an RFP whenever one is released. Considerable interest has been shown by those contacted and the interest of each group has increased noticeably during recent weeks. ✓

I was quite impressed by Wuenscher's presentation to PSAC B

NOTES 7-15-68 KUERS

B 7/18

7/17 GK

1. Visit from Purdue University, Lafayette, Indiana: Dr. M. Barash, Associate Professor of Industrial Engineering at Purdue University, visited us for informal discussions and exchange of experience on manufacturing technology developments. He was looking for support for a study of adaptive controls of machining processes whereby sensors would currently measure the workpiece and feed this data back to the controller of the machine tool. Since we have no specific need in our programs for such technique, we could not give him contractual support for his endeavor. However, we had very pleasant and fruitful discussions on many manufacturing technology subjects, including manufacturing processes in space under zero "g" environment. Dr. Barash is seeking to obtain a research grant from NASA for Purdue University for manufacturing technology studies. ✓

2. Contingency Payload for SA-503 (BP-30): Delivery of the first bulkhead for new ballast containers suffered a delay of another week because of a damaged spinning mandrel at our supplier. We will apply our best efforts, shift work, and overtime to minimize schedule impact on completion of the BP-30 payload. ✓

3. S-II Manufacturing Problems:

a. Rewelding of cylinder #6 to LH_2 bulkhead for S-II-10 which had been cut off because of excessive porosity and offset has been accomplished successfully at Seal Beach. ✓

b. Some insulation foam blocks on the bolting ring and cylinder #1 of S-II-4 and S-II-5 have debonded and corrosion has been detected on the metal surface of the debond areas. We are reviewing the bonding procedures in detail used by NAR for these stages in preparation for a meeting this week on this subject at Seal Beach. ✓

c. A skin panel for cylinder #6 for S-II-12 has been scrapped at the L.A. Division because a wrong tape was by error used in the skin milling machine. ✓

NOTES 7-15-68 LUCAS

7/17/68 B 7/18

1. S-II "B" STRUCTURE TEST (401) (UPPER PORTION OF LH_2 TANK & FORWARD INTERSTAGE: The forward skirt of the structural test item failed during an ultimate test of the max q flight condition being attempted at Santa Susanna, California, on 7-12-68. This was the first of three required ultimate test conditions. This test was aborted on 7-5-68 because of the inability to maintain pressure in the skirt area due to excessive leakage and because of high strain reading on the stringers adjacent to the access door. Body loads (i.e. longitudinal load, moment and shear) were applied in magnitudes to simulate the predicted AS-504 loads. (Note: These loads are lower than the S-II-4 - S-II-10 design loads.) The LH_2 tank was filled with liquid hydrogen. The forward skirt and the conical S-IVB adapter are a total loss, but it appears that the LH_2 tank portion of the structure is undamaged. Chuck Crockett and Jim Lewis of the Structures Division monitored the testing and are participating in failure assessments at Santa Susanna and Seal Beach. Rick Davis of the Materials Division left yesterday to participate in the failure assessments. The impact on the test program is unknown at present. ✓

2. MDA DESIGN CHANGES: In our notes of 6-24-68 we reported that we had received an IO go-ahead for the docking probe installation into Port 1 of the MDA. To install the probe in orbit requires a pressure cover over the Port which bulges out sufficient to allow shirt sleeve probe installation. This could be a bonnet type cover if sufficient clearance within the payload shroud is available or an inverted soft cover, which will bulge out at pressurization of the MDA. We have received IO go-ahead to assume the AS-203 type payload shroud and we are basing our design on this, even though headquarters has not baselined this shroud yet. The efforts to obtain a decision on the payload shroud have been going on for more than a year. ✓

Lee Below
What in the world is holding this up??
B

3. STATIC TEST OF S-IB-12 IS SUCCESSFUL: The short duration test of stage S-IB-12 was conducted on 7-10-68. Review of records indicates no engine problems. Bellows type LOX pump seals were installed on all eight engines for the test and will remain installed for the long duration test, after which the seal nose condition will be investigated. The type of LOX seal temperature sensing system which is planned for AS-205 launch was installed for this test and performed satisfactorily. ✓

4. ASTRONAUT TEST SUBJECT PARTICIPATION IN MDA NEUTRAL BUOYANCY SIMULATOR: On 7-5-68, Astronaut Paul Weitz served as a test subject in the neutral buoyancy developmental simulation of the MDA internal mobility aid concepts. In this simulation to select the preferred MDA internal foot restraint device from four possibilities, the astronaut's evaluation confirmed our previous conclusion. This initial participation by an astronaut as a test subject following our detailed Simulation Test Procedure (STP) provided the first opportunity to compare MSFC test subject performance with that of an astronaut, since previous astronaut participation in neutral buoyancy was for demonstration and familiarization. This confirmation increases our confidence in the validity of our simulation test procedures and evaluation techniques. ✓

5. NUCLEAR VIBRO-ACOUSTIC STRUCTURAL PROBLEMS: Space Nuclear Propulsion Office, Cleveland, has requested our support in solving potential vibro-acoustic structural problems resulting from operations of Engine Test Stand-1 and the "technology engine." We did similar engineering analysis for the recent Pheobus 2A engine firing under Los Alamos Scientific Laboratories cognizance. Due to our recent drastic manpower cuts we can no longer support most of the necessary effort. We will try to establish acoustic design criteria and will be available for consultation only. ✓

NOTES 7-15-68 MURPHY

7/17 B 7/18

1. Safety Assignment: I am now devoting full time to the safety activities.

2. System Safety Analysis for AS-503: A meeting was held at NASA Headquarters on Thursday, July 11, 1968, with representatives from the three Centers, to discuss a systems safety analysis for the AS-503 Mission which is being directed by Gen. Phillips. The purpose of the analysis is to:

a. Provide systematic identification of:

- Hazards that could lead to loss or injury to the AS-503 Mission crew; and
- Actions taken to eliminate or reduce those hazards to an acceptable level.

b. Provide the Apollo Program Director with visibility and acceptability of the risks/hazards, and the actions taken or recommended to eliminate or reduce unacceptable risks/hazards.

c. To provide a system safety analysis baseline for subsequent missions.

The study limits identified for this analysis by the respective Centers are as follows:

KSC - Crew pad ingress to tower clear (crew includes all pre-planned personnel access to pad after cryogenic loading).

MSFC - From S-IC lift-off signal to S-IVB IU separation (due to launch vehicle failure only).

MSC - Crew spacecraft ingress to recovery.

The activities are scheduled to be in two phases. Pnase I is to be completed for review with Gen. Phillips by mid-September, with a completion date for the Center of August 30, 1968. The Phase I effort will give an opportunity for reviewing the accomplishments prior to going into a Phase II effort which is supposed to be completed by November 15, 1968.

B 7/18

NOTES 7/15/68 RICHARD

7/17

No submission this week.

B 7/18

NOTES 7/15/68 SPEER

7/17 KD

1. Apollo 6 ALOTS Engineering Film: MSC (Dr. Gilruth) has expressed concern about the manner in which ALOTS (Apollo Light Optical Tracking System) original film was being handled and controlled, thus allowing possible degradation of this extremely valuable and irreplaceable data. This Center, as the principal user of engineering film, utilizes original film instead of copies for engineering analyses to effect cost savings. Based on our experience with this film on AS-502, it is considered necessary to improve our procedures and controls in handling certain classes of Apollo engineering film. We are taking action to prepare and coordinate an MSFC Management Instruction to encompass: restricted utilization of selected original film for analysis; film accountability and custodianship; marking and notations on engineering film; and packaging and shipping procedures.

2. AS-205 Flight Rules: The MSFC Flight Mission Rules inputs were jointly reviewed with the IB Program Office. The only significant open items are concerned with marginal engine start and running conditions which are being analyzed by P&VE and will be submitted to the Crew Safety Panel for approval. We expect no problem in meeting our 7/20 due date to Houston with the majority of our rules inputs.

3. AS-503 Camera Capsule Retrieval: MSC (Kraft) has offered the assistance of their Landing and Recovery Division in helping MSFC to upgrade the probabilities of retrieval success of the four S-IC camera packages on AS-503. We have accepted Kraft's offer and R-ASTR is forwarding to MSC a spare capsule with recovery gear and the necessary data on ejection and descent sequencing.

B 7/18

NOTES 7-15-68 Stuhlinger

7/17 NS

1. ATM PROTOTYPE EXPERIMENT ROCKET FLIGHT: American Science and Engineering obtained excellent high resolution solar X-ray images of an Importance 1N flare on June 8. The rocket-borne grazing incidence telescope is a prototype of the ATM-A, S-054 experiment with a collecting area of 34 cm^2 and focal length of 132 cm. A total of 12 exposures were taken during the three minutes of observation. The last four exposures were obtained with an X-ray transmission grating positioned immediately behind the telescope to disperse the radiation into spectra of various orders. Various filters were used to provide wavelength pass-bands of 3.5 to 14Å, 3.5 to 10Å, and 44 to 60Å. Over a dozen active regions were present on the disc, the most prominent being the one where the flare developed. All regions which were active in H-alpha have counterparts in the X-ray photograph. The flare region is more than an order of magnitude brighter than all of the other plages. The flare X-ray emission is distributed into two main structures, each several minutes of arc long and approximately 20 seconds of arc across. ✓

2. UNIVERSITY OF ALABAMA IN HUNTSVILLE AFFAIRS: Mr. Herbert Quinn, with the Office of University of Affairs in Headquarters, asked Dr. Shelton of SSL if he would attend a meeting on October 29-31, 1968, of the Federal Council for Science and Technology in Washington at the Smithsonian Institute. Dr. Shelton will talk about developments of the University of Alabama in Huntsville under joint Army and NASA auspices. ✓

3. NEUTRON ALBEDO FLIGHT EXPERIMENT: Personnel of SSL have gone to Palestine, Texas to make final preparations for the first balloon flight of a neutron albedo experiment, which we are conducting jointly with Oak Ridge National Labs. The objective of this experiment is to measure the neutron spectrum in the upper atmosphere. ✓

NOTES 7/15/68 TEIR B 7/18

7/17 TD

PAYLOAD WEIGHT FOR AS-205: In a meeting with MSC personnel and Gen. Phillips on 7/11/68 at MSC, George Low requested an additional 300 lbs. of payload be planned for AS-205. Primary purpose of additional payload is to assure sufficient propellant for planned SPS burns as well as provide some flexibility for last minute weight variations. We agreed to plan our trajectory data, software, etc., based on requested 36,600 lbs. payload, however, we would not commit completely until the computation of the Flight Performance Reserve (FPR) is completed. The FPR computation will be completed July 29, 1968. ✓

FLEX LINES: Reference my notes dated July 1, 1968, (copy attached) concerning the analysis being made to determine the flex lines which would be tested under environmental flow conditions prior to the AS-205 mission. Eight S-IB Stage lines and seven S-IVB Stage lines have been selected for testing prior to the launch of AS-205. Further analysis of the S-IB Stage lines may reduce the above number. All of these lines are Criticality II lines (none are Criticality I). We should complete the testing of the lines by August 15, 1968. ✓

Currently it appears that there are 13 J-2 Engine lines and 1 H-1 Engine line which must be tested prior to the AS-205 launch. We and the Engine Office are evaluating these lines to finalize the test schedule and determine which lines should be launch constraints for AS-205. ✓

S-IVB-205 AFT INTERSTAGE SAFETY FACTOR PROBLEM: Reference my memorandum to Mr. Rees and Gen. O'Connor dated June 26, 1968, (copy attached) concerning an indication that our safety factor for the S-IVB Aft Interstage was reduced to somewhere in the range of 1.30 and 1.37 based on the AS-205 operational trajectory with the most recent vehicle loads and thermal data included. P&VE and MDC have had several discussions concerning the safety factor problem and the proposed solution. We do not have a final position from P&VE yet but it now appears that the application of silicone insulation in the aft interstage will solve the problem. MDC is in the process of performing additional analysis to confirm that the silicone will reduce the stringer temperature sufficiently to give a 1.4 or greater safety factor. ✓ The addition of the insulation will result in payload loss of approximately 8 lbs. and the application of the insulation can be performed at KSC concurrent with other scheduled operations. ✓

PROPELLANT UTILIZATION (PU) SYSTEM: A meeting on the design and quality of the PU System with Dr. Rees, R&DO, MDC and NAR, has been scheduled for Tuesday, July 16, 1968, at 9:00 AM in the Center Conference Room. The purpose of the meeting is to review the present status of the PU design and quality and to establish what, if any, specific actions are required to improve the design and our confidence in the system. ✓

NOTES 7/15/68 WILLIAMS B 7/18
7/17 TS

1. Lunar Program: We plan to begin some dynamic testing of lunar mobility items using the Boeing and Bendix built MTA's. This test program will be conducted within the MSFC complex using Test Laboratory and BECO to conduct tests under P&VE direction, and is to supplement previous tests conducted at Aberdeen Proving Ground and at Yuma Proving Ground. Two lunar drills (engineering models) have been built and tested with some additional tests to be conducted. Responsibility for the effort rests with R-TEST, with Principal Investigator (PA) assigned to R-SSL. R-P&VE-M is about to begin some DC torquer motor tests in vacuum chamber located in Building 4612 to determine the adaptability of this type motor for Lunar Roving Vehicle application. We are attempting to obtain additional funds for this effort, to support the ongoing LRV study effort. ✓

2. Program Memorandum: We have reviewed the initial Bellcomm draft of the Extension of Manned Space Flight Program Memorandum and datafaxed comments to Mr. Lord. The program memorandum identifies two program options for accomplishment of MSF goals in the mid-70's. These options are the concepts described by MSFC and MSC; that is, a Saturn V launch option and Saturn IB option, respectively. The program memorandum draft is to be forwarded to BOB on Monday, July 15. The draft we reviewed appeared very rough and not yet suitable for publication nor release to the BOB, and we have expressed these thoughts to Mr. Lord and Dr. Dixon along with our offer to send people to Headquarters to work directly on the problem with MSF. ✓

3. Backup Workshop Conversion to Dry Launch on Saturn V (B-O configuration): A review of some McDonnell/Douglas work regarding potential utilization of AS-210 for a dry workshop was covered on July 11, 1968. The significant conclusions were: a. The approach is technically feasible, b. It is possible to hold the option of flying a backup wet workshop open through the time frame of the first wet workshop launch and still convert to a rudimentary dry launch workshop within 12 to 18 months of the initial wet workshop launch. The relative merits and cost comparison of B-O versus a second wet workshop has not been evaluated but will be conducted within the next 30-60 days. ✓

4. MSC System Test Bed: Chuck Mathews was at MSC on July 11, 1968, and during his time there went through the 15' diameter systems test bed which their advanced studies group had built by the Martin Co. MSC is also constructing a 15' diameter crew module and expects to have an astronaut walk-through within three or four weeks to evaluate the worth of the 15' shell. We intend to take a group to MSC to go through the systems test bed and mockup on the week of August 5. ✓

5. Launch Vehicle Study (S-IC/S-IVB): All necessary approvals, including signing of D&F have been obtained. The RFQ is expected to be issued to Boeing by 8-1-68. ✓

6. OTES: We signed the Optical Communication contract with Chrysler and Perkin Elmer on July 12, 1968. ✓

July 22, 1968

NOTES
MR. GORMAN'S COPY
JUL 22 1968

With comments
(none for DEP-A)

~~1. Reading file~~ 2355
2. NOTES file

August 2, 1968

Dr. von Braun:

In reply to your comment on Col. James' 7-22 Notes (copy attached), since late 1964 ASTR, QUAL, and P&VE have been interchanging information and opinions on the problems associated with stress corrosion in the Saturn actuators, especially those for the S-IC stage. From the beginning, P&VE has recommended changing the actuator material to 7075-T73 aluminum, which, while less susceptible to stress corrosion, does not completely eliminate the problem. Redesign of the S-IC actuators was studied and several engineering problems arose such as contour, stage armoured harnesses, and heat treating difficulties. In view of this fact and the lack of any failure experience on hydraulic actuators attributed to stress corrosion on other aircraft and missile programs, we took the stand that redesign was not necessary. This is documented in my memo to Mr. Weidner dated July 26, 1966. However, manufacturing process changes recommended by Boeing as minimum requirements were implemented to reduce the susceptibility of the present materials to stress corrosion. These were closer machining prior to heat treatment, shot peening of certain surfaces, and painting the exterior with a special paint. Four actuators on 501 and 502 had this complete modification and four had only the external painting. However, since recent test results have again raised the question of actuator failures because of stress corrosion, an agreement was reached on March 20, 1968, to have the actuators redesigned using 7075-T73 aluminum alloy. This has been implemented by Boeing change order and will be implemented on 506. 503, 504, and 505 will have Boeing actuators with the preventive modifications mentioned above.

This note has been coordinated with the P&VE Materials Lab, and we have, at all times, maintained close contact and cooperated with this lab in this and related matters.

B 8/11

W. Haeussermann

1 Enc:
a/s

NOTES 7-22-68 JAMES

B 7/25

1. POGO: During the teleconference on July 15, 1968, General Phillips and Dr. Mueller approved the LOX pre-valve accumulator method of eliminating POGO. All stage hardware to incorporate the modification on AS-503 has been delivered to KSC and is now being installed. The mod deliveries (including GSE) and work plan support the S-IC power-on scheduled for July 29, 1968. ✓

2. Joint Space Vehicle Structural Assessment Team (J SAT): This team, under Larry Mulloy, P&VE, and R. E. Vale, MSC/TA, is getting underway as proposed in LDX telecon July 15, 1968. Lead responsibility was assigned to MSFC by General Phillips. Presentation to senior management is planned around August 15, 1968. ✓

3. Short Stack Structural Test: Cracks detected in SM 008 required its shipment from Wyle Labs, Huntsville, to Downey for assessment of suitability for the structural test. SM 012 is available as a replacement if needed. Schedule planning still supports a "go-no go" decision for AS-503, completion of testing being set for early September. ✓

4. Stress Corrosion of S-IC Stage Servoactuators:
Results of the severe environment tests at Michoud have confirmed that all presently available S-IC actuators are stress corrosion susceptible.
Redesigned actuators with stress corrosion susceptible material removed are being developed and are scheduled for retrofit on S-IC-6. Since development schedules do not permit use of the new actuators on S-IC-3, 4, and 5, the least stress corrosion susceptible actuators will be used.

5. AS-503 Launch Vehicle Erection Schedule at KSC:
S-II . . . . July 25, 1968
S-IVB . . August 5, 1968
IU. . . . . . August 5, 1968 ✓

6. S-IVB-506 Captive Firing: The S-IVB-506N Stage was static fired for 445.2 seconds on July 17, 1968. Preliminary information indicates all test objectives, including the O_2H_2 Burner restart capability, were successfully met. ✓

7. Saturn V Real Time Target Update: Reference Dr. Geissler's notes of July 8, 1968, and your note to me on the above subject. Dr. Mueller and General Phillips directed that the Saturn V Launch Vehicle have the capability to accept a target update via the MSF Flight Mission Assignments Document. We are working with Ludie Richard's office and the Real Time Target Update Team (MSC and MSFC membership) to define whether this capability will be needed and what it would require. We do not consider this a major new undertaking for MSFC.

→ Walter Haeussermann

Why was this development not coordinated with P&VE?
They have had an anti-stress corrosion program for over 2 years! Awfully late to discover this now!! B

B 7/25

NOTES 7/22/68 BALCH

S-II-5 - In last week's NOTES, it was stated that the LH_2 pumps would have to be replaced because they had been spun backwards when a power failure occurred while the fuel ducts were pressurized to 30 psi. This was not entirely correct. The LH_2 recirculation pumps were spun backwards as stated but after thorough examination, it was decided not to replace them. However, they were all removed for examination when electrical connectors were found to be faulty on two of them. They have now been reinstalled and retested. Static firing has been rescheduled from 7/23/68 to 7/25/68. Meeting this new date is dependent upon the return of the LH_2 helium pre-pressurization line from the West Coast today as scheduled and the satisfactory cure by 7/25/68 of the insulation refoam around the LH_2 recirculation pumps and lines.

S-II-6 - Mods to Augmented Spark Ignition (ASI) lines have been completed on Engines No. 1 and No. 3, and engines have been repositioned. Engines No. 2 and No. 4 have been lowered, and mods to ASI lines on these engines have been started. The stage contractor has released a new schedule which changes the date for cryogenic proof pressure test fron 8/22/68 to 9/5/68.

S-IC-6 - Propellant load test was performed on 7/15/68 and 7/16/68. Test objectives were achieved, and no major problems were encountered. In accordance with a NASA Headquarters/MSFC decision made early this past week, a modification is being made for using helium in the LOX prevalve accumulator to reduce in-flight pressure oscillation as experienced during the SA 502 flight. This modification will be active during the static firing of the S-IC-6, which is still scheduled for 8/6/68.

Mobile Acoustics Research Laboratory (MARL) - The "MARL" and the S-IV-B interstage have been mated in the S-IC complex. Instrumentation installation will begin today and will be complete by tomorrow afternoon.

LORAN D Army Project - The mission of this project has been completed, and site clearance is expected by 8/1/68.

Public Affairs - Invitations to attend the S-II-5 static firing on 7/25/68 have been extended to legislative leaders from 13 southern states, who will be in convention at Biloxi, Mississippi, at the time.

Mr. Ralph Morse and Mr. Dave Sheridan, LIFE photographers, will be taking pictures of the S-II-5 firing this week for use in conjunction with Dora Jane Hamblin's Saturn story.

NOTES 7/22/68 BELEW

B 7/25

ATM EXPERIMENT COORDINATION MEETING: An ATM Experiment Coordination meeting was held at MSFC on July 16-17, with the Principal Investigators (PI's), ESSA, Martin, MSC, Headquarters, KSC and MSFC in attendance. The PI's expressed concern over the limited number of data-taking days (36) out of the 56-day mission. The Martin Company presentation indicated that approximately 90 percent of the PI's data-taking requirements can be met within the presently allotted 36 days.

REVIEW OF BALL BROTHERS RESEARCH CORPORATION (BBRC) HCO-A STATUS: A review of BBRC on July 16, for the purpose of evaluating their capability to successfully execute the HCC-A effort in conjunction with other commitments, indicates that they can basically handle the job.

PROCUREMENT RESTRICTIONS: Teletype dated July 12, from Director of Procurement, directs that all AAP procurement actions be approved by Headquarters prior to release by the Centers. This applies to all material purchases, incremental funding of existing contracts, within scope changes, new procurements, etc., regardless of dollar amounts. In FY68, we would have processed approximately 950 - 1000 actions to Headquarters in the ATM Systems Project to satisfy this requirement. The impact of these restrictions will be such that we probably will not be able to proceed with the program and keep all aspects in proper balance.

CONTROL MOMENT GYRO (CMG) ON WORKSHOP: As indicated by Dr. Mueller's comments on the trip to Huntington Beach (July 19), he is still pushing for a CMG control system on the Workshop. A reevaluation of the CMG system versus the Workshop Attitude Control System has been completed and reviewed with Headquarters (Bellcomm). The CMG system does not show a cost advantage that changes our present position using the WACS.

NOTES 7-22-68 BROWN

B 7/25

F-1 Engine

POGO - Testing continues at RETS to demonstrate engine compatibility with the prevalve accumulator. The first stability rating test has been completed. The main chamber damped in 71 ms, well within the 100 ms required for the Qual I injector which is on the engine. However, the bomb triggered about 40 seconds of 300 cps oscillations in the gas generator. There were three bursts of oscillations of 600 psi peak-to-peak followed by bursts of 200-250 psi. There was no apparent correlation between the oscillations and the use of helium. The prevalve replenish flow was started two seconds after the bomb initiation. There was no indication of a helium bubble in the pump inlet at start.

BB. Could this oscillation level be critical if it occurred in flight? Do we have any explanation now? B

During reinspection of 4 way control valve filters which had been removed from engines as a part of an inspection for aluminum particles in the hydraulic control system, it was noted that epoxy patches which are used on the filters were loose or missing. These patches, which, are used to control the cross-section of the filter in order to meet filtering requirements, are apparently being loosened by the recleaning process. Although the likelihood is small that the loose patches would cause trouble, all filters containing patches are being replaced, including the filters on AS-503. Fortunately Wintex, one of the two vendors (the other is Hydraulic Research), has never used patching to meet acceptance specifications and non-patched filters are available. Change out on AS-503 is expected to take one day and reverification testing will be accomplished by normal in-sequence checkouts.

No relation between these two items? B

J-2 Engine

The leaking gas generator control valve on the engine installed in AS-205 has been reworked and reinstalled on the engine.

Prior to the last scheduled S-II battleship firing, an engine ready signal could not be obtained on one of the five engines. Further checkout revealed that the electrical control assembly was malfunctioning. The ECA was removed and the connector was full of moisture. The ECA will be replaced. The cause of malfunction is currently under investigation.

NOTES/7/22/68/CONSTAN

B 7/24

NASA/ASEE Summer Faculty Fellows Visit Michoud

Some fifty NASA/ASEE (American Society for Engineering Education) Summer Faculty Fellows visited Michoud for a briefing and tour Wednesday, July 17. The group, enroute from the Marshall Center to the Manned Spacecraft Center, was briefed by Mr. James Stamy before being escorted on a tour of the Manufacturing Building. ✓

NOTES 7/22/68 GEISSLER B-7/25

1. Venting of the S-IVB Hydrogen Tank in Flight: For clarification of our Note of 7/8/68 (copy attached) on this subject, we would like to emphasize that we feel confident that the venting of the H_2 at the presently proposed low flow rates will not compromise the safety of the flight. However, experimental data on gas dissipation from vents of our type are virtually non-existent. Our estimates for AS-205 were based on extrapolation of a few data points from a program on thrust vector control. With our "No H_2 venting in First Stage Flight," rule now set aside, we have to expect requests for larger vent rates sooner or later. It is therefore, mandatory that we undertake an experimental program to have sufficient data in time. We expect the experimental program to be inexpensive, with most or all of the work done in our own wind tunnels.

2. Libration Points of the Earth-Moon System: Of the five major experiments planned for the ATM, one is a white light chronograph sponsored by the High Altitude Observatory (HAO). This has an optical instrument with a 3^0 field of view always centered on the Sun. We have found this experiment extremely interesting and at the request of SSL have done some work in connection with it. The instrument might be used to view the triangular Lagrangian points L4 and L5 of the Earth-Moon System if they should come within the 3^o field of view during the ATM mission. It would be particularly interesting to determine whether clouds of particles have accumulated at these points. The presence or absence of particles at these points might allow inferences to be made of the strength of such perturbing forces as the Solar Wind. We have determined that Libration point L5 would be visible within the field of view of the HAO on July 27, 1971, and point L4 sometime during the second week of August 1971.

3. Post Flight Trajectory: A Post Flight Trajectory Subpanel Meeting was held July 16, 1968, at MSC. The main item covered was the division of responsibility between MSFC and MSC on the AS-205/CSM-101 mission. The post flight trajectory will be MSFC's responsibility up to space-craft separation. After this time, the trajectory of the S-IVB stage will be MSFC's responsibility except for a several hour period around rendezvous where the post flight trajectory responsibility will belong to MSC.

B

NOTES 7-22-68 GRAU B 7/22

1. S-II: Additional nondestructive tests on the S-II-11 Common Bulkhead suspected debond areas indicated that no debond condition exists. Four of the seven areas have extra layers of adhesive (allowed by specification) and three areas have slanted core material (not covered by specification). The accepted material review disposition was to use as is. There was no significant workmanship or process control problem; however, the lack of specification of allowable core slant is a problem. P&VE will define the degree of core slant allowable. ✓

A significant improvement has been realized in decreasing the number of squawks written by both the contractor and NASA during the final "shakedown" of the S-II Stage. There were 1500 squawks written during the shakedown inspection of S-II-4 and 245 written on S-II-7. This improvement is the result of additional emphasis on performing work in station. ✓

The S-II-1 and S-II-2 umbilical disconnects (ground halves) showed evidence of considerable amount of contamination present and possible corrosive damage. Investigation has disclosed that NR and KSC preventative maintenance procedures were not applicable. Action is now being taken by NR to have the disconnect supplier, Royal Industries, to clean and refurbish these S-II-1 and S-II-2 disconnects. applicable, or applied? B

2. S-IC: A record search revealed that the Inboard Lox PVC Duct installed on S-IC-503 is not qualified. The PVC on 503 is identical to the one that flew with S-IC-502. The qualified design had several significant changes over the one installed on S-IC-503. It was recommended that the unit on 503 be replaced with the qualified one piece gimbal yoke design that is representative of the unit that was subjected to qualification testing. This activity is being coordinated with personnel of I-MICH-Q and Boeing Company. ✓

Ed O'C. Suggest some suitable crackdown and co-ordination with MSC B

3. IU STRUCTURAL SURVEY: The IBM survey at Tulsa was just completed with our participation. The same deplorable conditions were discovered there as were also found one year ago. Typical things found were inadequate procedures, lack of traceability and many out-of-spec conditions. We found things such as the incorrect density honeycomb core being used, brackets out of position due to incorrect tooling, autoclave operating out of spec. I have no reason to believe that the situation is better on the SLA. We are trying to establish confidence that the proper material was used in the AS-205 and -503 IU structure. We are also inputting these findings to the SLA/IU Honeycomb Structure Review team.

4. MSC SUPPORT: This Laboratory has accepted the responsibility to monitor testing, modification, and inspection of the LEM and CSM Short-Stack at the Wyle Labs in Huntsville. This is in addition to our support of the Short-Stack Testing at MSC. ✓

NOTES 7/22/68 HAEUSSERMANN

B 7/25

1. ATM Digital Computer. Haeussermann notes 7/1/68 indicated that we had to provide supporting data to NASA Headquarters and why we were not using the LM computer for the ATM functions. A teletype was prepared in conjunction with Mr. Belew's office which apparently has not satisfied a few individuals in NASA Headquarters and they will be here tomorrow to try to understand the situation. We hope we will be able to convince these individuals and resolve this problem once and for all. There has already been an inordinate amount of discussion and justification on this subject.

2. MSC-Apollo Inertial Components. Because of the high failure rate and despite the high number of spares, MSC has to obtain 40 additional gyros for the current Apollo program. Since the original manufacturer (AC Electronics) lost its capability to manufacture these gyros, MIT will build 8 gyros in their own facilities; the remaining 32 gyros have been contracted with Bendix, Teterboro. Bendix is considered now the only company capable to produce these gyros - if anybody at all possesses this art.

↑ Eberhard Rees

Sounds like a potentially critical situation for the entire program. Please discuss with Haeussermann what the engineering help through Bendix's shop is possible.

B

NOTES 7/22/68 HEIMBURG B 7/25

ARM 9 TESTING KSC personnel (Middleton and Preston) were here Tuesday, July 16, to discuss test schedules for remaining access arms. We will be able to satisfy their requirements without being on the critical path provided test hardware can be delivered as promised. We will reconvene on August 15, to reassess schedules once again. Testing of existing Arm 9 is progressing satisfactorily and will probably complete program several days ahead of schedule.

F-1 TURBOPUMP (POGO) Four turbopump tests were successfully conducted this past week. The first test was at a lox pump inlet pressure of 90 psia with helium (0.01 #/sec) in the lox prevalve cavity The lox system was pulsed from $1\frac{1}{2}$ to 19 cps using the suction line pulser. The second test was at a lox pump inlet pressure of 110 psia with helium (0.01 #/sec) in the lox prevalve cavity. The pulsing frequency was 10-19 cps using the lox suction line pulser. Test numbers three and four were conducted at lox pump inlet pressures of 130 psia and 110 psia respectively and with the prevalve cavity filled with lox. The lox system was pulsed from 2 to 25 cps using the suction line pulser There will be no turbopump testing this week in order to keep from interfering with the static tests of S-IB-12. Turbopump test should resume the week of July 29.

S-II STRUCTURAL TEST PROGRAM The structural tests, Phase IIB and Phase III, were successfully conducted on July 15 and 19, respectively. The LN_2 gage calibration test is scheduled for July 24, 1968.

S-II-5 The acceptance static firing test for S-II-5 has been rescheduled for July 25, 1968, due to the requirement to change the numbers 2 and 5 recirculation pumps which were damaged in attempts to remove the power plugs. There are three special test objectives in conjunction with the acceptance firing. One is to evaluate forward bulkhead chilldown at 1500 psig prepressurization regulator setting and a second is to verify cracking and reseat settings of the LH_2 vent valves under cryogenic conditions. The third will be an evaluation of engine number four, LH_2 pump inlet temperature with improved vacuum jacketed system. New fuel ASI lines and new lox sump screens and baffles are installed for the test. Additional instrumentation has also been incorporated as a result of AS-502 flight anomalies.

S-IVB-506 (SACTO) Firing was accomplished at about 5:30 pm, July 17, for 445.2 seconds duration. Performance of all systems was satisfactory. Prior to the test, two satisfactory burns of the O_2/H_2 burner were made.

S-IB Test SA-56, a duration test of Stage S-IB-12, is scheduled for July 25, 1968.

B 7/25

NOTES 7-22-68 HOELZER

RESOURCES SHARING: Presentations were given to representatives from Sentinel Command, Corps of Engineers, JPL and OMSF on various computerized systems at MSFC by personnel of the Data Center Division. Documentation was requested and is being furnished on some of the systems. Personnel from ERC also requested documentation on several MSFC systems through the Resources Sharing System of OMSF. This documentation is also being provided.

NOTES 7-22-68 JAMES

B 7/25

1. POGO: During the teleconference on July 15, 1968, General Phillips and Dr. Mueller approved the LOX pre-valve accumulator method of eliminating POGO. All stage hardware to incorporate the modification on AS-503 has been delivered to KSC and is now being installed. The mod deliveries (including GSE) and work plan support the S-IC power-on scheduled for July 29, 1968. ✓

2. Joint Space Vehicle Structural Assessment Team (J SAT): This team, under Larry Mulloy, P&VE, and R. E. Vale, MSC/TA, is getting underway as proposed in LDX telecon July 15, 1968. Lead responsibility was assigned to MSFC by General Phillips. Presentation to senior management is planned around August 15, 1968. ✓

3. Short Stack Structural Test: Cracks detected in SM 008 required its shipment from Wyle Labs, Huntsville, to Downey for assessment of suitability for the structural test. SM 012 is available as a replacement if needed. Schedule planning still supports a "go-no go" decision for AS-503, completion of testing being set for early September. ✓

4. Stress Corrosion of S-IC Stage Servoactuators:
Results of the severe environment tests at Michoud have confirmed that all presently available S-IC actuators are stress corrosion susceptible.
Redesigned actuators with stress corrosion susceptible material removed are being developed and are scheduled for retrofit on S-IC-6. Since development schedules do not permit use of the new actuators on S-IC-3, 4, and 5, the least stress corrosion susceptible actuators will be used.

5. AS-503 Launch Vehicle Erection Schedule at KSC:
S-II.... July 25, 1968
S-IVB.. August 5, 1968
IU...... August 5, 1968 ✓

6. S-IVB-506 Captive Firing: The S-IVB-506N Stage was static fired for 445.2 seconds on July 17, 1968. Preliminary information indicates all test objectives, including the O_2H_2 Burner restart capability, were successfully met. ✓

7. Saturn V Real Time Target Update: Reference Dr. Geissler's notes of July 8, 1968, and your note to me on the above subject. Dr. Mueller and General Phillips directed that the Saturn V Launch Vehicle have the capability to accept a target update via the MSF Flight Mission Assignments Document. We are working with Ludie Richard's office and the Real Time Target Update Team (MSC and MSFC membership) to define whether this capability will be needed and what it would require. We do not consider this a major new undertaking for MSFC. ✓

→ Walter Haeussermann
Why was this development not coordinated with P&VE?
They have had an anti-stress corrosion program for over 2 years! Awfully late to discover this now!! B

NOTES 7/22/68 JOHNSON

B 7/25

Aerospace Medicine/Biotechnology Program Review - Mr. Miles attended a Program Review Meeting at Headquarters the 18 and 19, called by Dr. Walton Jones, Director of Biotechnology and Human Research Division of OART. Dr. Jones and Gen Humphreys, co-chairmen of the meeting, laid out a plan leading to inputs from the Aerospace Medicine efforts into the BOB program memoranda in at least three of the four following working groups; 1. Lunar; 2. Extended Man Space Flight; 3. Space Technology; 4. Aeronautics. The immediate objective is to develop a "Program Source Document" (5-year plan) through the efforts of three working groups: 1. Life Support and Protective Systems; 2. Man-Systems Integration; 3. Human Research. Marshall has proposed two members: Mr. C. May (R-ASO) and Dr. J. Rodgers (R-P&VE) on the second group. MSFC has not been invited to participate on the other two. A three-day meeting of these three groups will be held in Washington beginning July 31. Dr. Jones' staff will prepare the program memoranda from these Program Source Documents and have them ready for BOB presentation September 3.

To provide for a continual review of the five-year plan a Management Board was proposed which would be co-chaired by Dr. Jones and Gen. Humphreys, and contain seven members one of which would be a Marshall Representative (Dr. Johnson's name has been recommended). ✓ A letter is expected within the week describing the objectives of the Board for the Aerospace Medicine Program and asking for a nominee. ✓

NOTES 7-22-68 KUERS

B 7/25

Computer Analyses and Control of Metal Movement during Welding:

The maximum "offset" permitted in the Saturn V is approximately 1/32". This is a critical type of defect. Offset is not reparable in the common sense. The weld joint must be completely removed, the two parts again fixtured, and rejoined by welding. Offset can result from tolerances in component fabrication and from inadequate fixturing. However, cylinders that have been very accurately constructed and most carefully fixtured may exhibit offset after welding. This is due to movement of metal during welding. Unequal rigidity of the two parts or uncentered thermal patterns results in differential metal movement and consequent "permanent" offset. A most recent example is the S-II bulkhead to Y-ring weld.

In the last two years, the ME Laboratory has sponsored two R&D studies dealing with metal movement during welding. The contractor principal investigators presented the technical accomplishments to the laboratory on July 16, 1968. The objectives of the studies have been twofold: (a) to obtain a mathematical definition of metal movement that can, by use of a computer, become a research tool in analyzing an indefinite number of combinations of variables, and (b) to devise a means of controlling welding thermal patterns.

The study that will satisfy the first objective is being conducted by the Battelle Memorial Institute. The principal investigator is the internationally recognized authority in weldment residual stresses, Dr. Koichi Masubuchi. Dr. Masubuchi has defined metal movement during welding as a function of material rigidity and thermal pattern magnitude. Now available for use in our continuing investigations are two computer programs. One program will enable us to predict welding isotherms, knowing the welding energy input and the welding travel speed. The second program is a prediction of the magnitude and distribution of dynamic stresses, given the isotherms and the changing yield strength of the material at each isotherm. The use of computer analysis in welding development is a relatively recent innovation which the ME Laboratory has been interested in and instrumental in bringing about.

The second study, made by the Harvey Aluminum Company, has been an approach to controlling the thermal patterns caused by welding. By cryogenically chilling an area behind and adjacent to the molten weld puddle, stresses resulting from local expansion of metal can be neutralized. The shrinking metal in the chilled area allows the metal around the weld to expand and alternately to shrink. The study will be continued in the ME Laboratory to further define the optimum thermal patterns and to devise practical application modes.

NOTES 7-22-68 LUCAS

B 7/25

1. POGO: The third LDX Management Review of the Space Vehicle Oscillation Program was conducted as scheduled on 7-15-68. The decision was reached to incorporate, in AS-503 and subs, the "fix" (helium charged prevalve accumulators in all five LOX lines) recommended unanimously by the POGO Working Group. All hardware for the selected POGO fix is on hand at KSC and installation on AS-503 will be completed in time to support "power on" by 7-29-68. The LOX line prevalve accumulators have been installed and the remaining hardware for the POGO fix will be installed in S-IC-6 by 7-26-68. This supports the scheduled firing date of 8-6-68.

2. J-2 ENGINE: A leaking fuel poppet on the GG control valve on S-IVB/205 required that the valve be returned to Rocketdyne for rework. Metal chips were found on the seat which were thought to have caused the leak. Upon return from Rocketdyne the valve was reinstalled in S-IVB/205 and again leaked during leak checks. The valve has again been removed and returned to Rocketdyne for disassembly, inspection and rework.

Bill Brown
222, B

3. S-IVB-506 ACCEPTANCE FIRING: The S-IVB-506 acceptance firing was accomplished on 7-17-68. The firing was a full duration (445.2 seconds) and cutoff was by LOX depletion. Cold helium leak checks were performed prior to and after the firing. No leaks were noted. The cold helium system incorporated the latest teflon coated conoseals throughout and the modifications seem to be satisfactory. This is the first stage firing of the restartable O_2/LH_2 burner. Two successful burner firings were accomplished; the first was a normal firing, and the second demonstrated restart of the burner. Peeling of Korotherm insulation around the auxiliary tunnel on the forward skirt was noted and recorded by camera. We have learned that this has happened before (S-IVB-505).

4. SATURN IB: The evaluation of the AS-205 pull test has been completed. The average variations in the strain-to-load constant are about 10% between AS-204 and AS-205. This difference is not due to a redistribution of loads as originally suspected but is due to a variation in the strain gages (gage factor, installation, etc.). This variation in strain-to-load constant illustrates the need to calibrate the gages prior to each flight. A pull test is the best means for calibration, since it provides an end-to-end check of the strain gage system.

5. HABITABILITY EXPERIMENT M-487 (FOOD, WASTE MANAGEMENT, HYGIENE): The new MSC Principal Investigator (Mr. Cadwell Johnson) stated to Fred Edwards (our development center monitor) that MSC plans to do the basic engineering, feasibility, and concept studies of M-487. Later MSC will turn these results over to MSFC for hardware implementation. He indicated what amounts to a reorientation of MSC's approach to the OWS. According to Mr. Johnson, present OWS engineering and design have been overly influenced by localized opinion at MSC, and importance in the future will be attached to operational capability in space stations at the expense of medical desirability or psychological implications. We hope that one way or the other an acceptable philosophy will harden soon.

6. AAP MDA BASELINE DECISIONS (BIOMEDICAL EXPERIMENTS): Reference Notes 7-8-68. The answer to your question is NO. So far, we have been unable to identify a balanced capability (thru all the laboratories) to do the job. However, we are still trying to work out a way to do the job and we are continuing to clarify what is to be done.

NOTES 7/22/68 MAUS

B 7/25

FY-70 BUDGET PREPARATION - In prior years NASA Headquarters prepared preliminary estimates for the budget year which normally involved several alternate program levels. Subsequent to the submission, BOB often requested data for additional options. For all options NASA utilized data from the Apollo Cost Study Computer Program. MSFC, therefore, influenced the budget preparation by providing the Apollo Cost Data to NASA Headquarters through MSF.

For the FY-70 budget preparation NASA did not give BOB preliminary estimates as in the past. This year BOB requested several specific analytical studies for use as a basis in the preparation of a Program Memoranda and for budgetary decisions. The source for the Program Memoranda will be the Newell Planning and Steering Group utilizing the cost and programmatic data from working groups, such as Rosen's Special Launch Vehicle Group.

MSFC will now influence the budget preparation by providing data directly to Rosen's group. Last week we provided up-to-date preliminary information to Rosen, which was based on the latest Apollo Cost Study and which represented figures substantially lower than last year's figures.

REDUCTION IN FY-69 ADVANCED MANNED MISSIONS PROGRAMS - Doug Lord has notified us of the following reductions in MSF's FY-69 programs: Advanced Studies - $5.0M to $2.5M, Supporting Development - $32.0M to $18.2M, and Experiment Definition (FY-68 & 69 total) - $21.0M to $11.0M. MSFC was requested to revise planning for FY-69 in accordance with these reduced funding levels. Direction was given to suspend further contractual activity for Experiment Definition and to submit contract status including contractor amount and date obligated. This information was submitted Wednesday, July 17. He also requested revised FY-69 proposals for Advanced Studies to include Saturn V Workshop Follow-on Studies and a priority listing of Supporting Development Tasks which will be submitted as a supplement to POP 68-2. As general guidance in the assignment of priority of work, a Space Station Program was defined as the most probable new major Manned Space Flight Program start.

NOTES 7/22/68 MURPHY

B 7/25

Operational Readiness Inspection (ORI) of Neutral Buoyancy Operations:

The Operational Readiness Inspection Demonstration of operation on the large neutral buoyancy simulator will be held Tuesday and Wednesday, July 23 - 24, 1968, for MSC. The MSC people include: Dr. Willard Hawkins, Medical Operations Office; Lt. Commander Paul Weitz, Astronaut; Mr. Fred Burns, AAP Office; Mr. Louis Richard, Crew Systems Office; and Mr. John Conlon, Flight Safety Office. The purpose is to demonstrate safe operations, prior to clearing astronauts for pressure suit operation in our tanks. As you know, this is the first ORI which has been conducted within MSFC to pre-determine hazardous, or potentially hazardous, conditions and provide procedural or hardware fixes to insure safe operations.

The small group of R&DO specialists that conducted this readiness inspection are to be commended. We intend to use this method to insure personnel and hardware safety on similar projects in the future.

NOTES 7/22/68 RICHARD

B 7/25

Guidance Software Task Force: The final meeting of the Guidance Software Task Force was held in Houston on July 12, 1968. The MSFC part of the program was well planned and coordinated by Jerry Mack of Astrionics, with IC, R&DO and IBM support. Our part was well accepted.

The final report of the committee will briefly highlight the status of software as assessed by Dr. Mueller and the Task Force, with recommendations on software management and approaches in the future. Although this was supposed to be the final meeting, Mr Luskin will be asked to arrange one AAP briefing for the Task Force in about three weeks.

B 7/25

NOTES 7/22/68 SPEER

1. Apollo Night Launches: OMSF recently requested the Centers to investigate the capability for support of night launches. Such capability will exist by mid-1969. KSC is procuring fifty Xenon searchlights from Fort Belvoir to meet requirements for engineering sequential and documentai cameras as well as abort advisory system requirements. DOD has advised that the operational capability for launch site abort recovery support during nighttime will exist in the first quarter of CY69.

2. GSFC Mission Data Management Seminar: A Mission Data Management Seminar was held on July 15 and 16 to review GSFC's experience in the areas of experiment mission data, experiment flight operations and control, and their relationship with experiment PI's. These are areas of direct concern to both MSFC and MSC due to their applicability to AAP and ALSEP. The presentations and ensuing discussions exemplified the magnitude and complexity of the data management problems associated with our AAP missions. Some points of interest: (a) GSFC flight missions are managed and operated on an individual experiment project basis leading to considerable variations between projects. (b) GSFC emphasized the importance of maintaining close coordination with PI's during all phases of the project and operations and claimed a rather informal academic/scientific environment. (c) GSFC provides the PI with as much flight data as he desires, but only as separated raw data. Even with this limited data processing, the task takes on an unbelievable magnitude; e.g. 1,700 magnetic tapes and 5,100 digital tapes per week which is their current and increasing rate. Much can be learned from GSFC in these areas and we are arranging follow-up sessions with GSFC personnel.

3. ATM Data Requirements: We have initiated efforts to determine the total data requirements for the ATM Mission and to assess the compatibility of these requirements with the existing data management capabilities. A series of meetings will be held with the PI's during the next two months. A preliminary listing of the total ATM data requirements is scheduled for completion by mid-December 1968.

B 7/25

NOTES 7-22-68 Stuhlinger

1. NEUTRON ALBEDO FLIGHT EXPERIMENT: The MSFC-Oak Ridge National Labs Neutron Albedo Flight Experiment, which I mentioned in my NOTES of 7-15-68, was successfully launched on a balloon flight last Friday, July 19 from Palestine, Texas. It reached an altitude of 106,000 feet. Early telemetry and data appeared satisfactory, but later overheating of the instrumentation influenced the quality of the data transmitted. The balloon was cut down after a total flight time of five hours.

E.S.
Did we get the info we sought?
B

2. AIR FORCE ACADEMY SEMINAR: Dr. Shelton of SSL will present a three hour seminar on advanced propulsion at the Air Force Academy this afternoon. Part of his material is expected to be incorporated into the regular curriculum of the Academy.

NOTES 7/22/68 TEIR B 7/25

VENTING S-IVB HYDROGEN TANK IN FLIGHT: Reference is made to your note on Dr. Geissler's notes of 7/8/68 (copy attached) asking why we did not advise the DCR Board that the pressure reductions involved to meet the fracture mechanics criteria on the LH_2 tank would require venting of gaseous hydrogen throughout the first stage flight. It was recognized that LH_2 venting could occur during first stage boost, but with the vent setting agreed upon at the DCR, this venting in all probability would not have occurred until late in first stage flight. Since the venting would be occurring in the upper atmosphere it was not considered to be a problem; however, after the DCR, when we reduced the vent and relief valve setting by an additional 1 psi, it made it possible for venting to occur during the entire boost period. P&VE has furnished AERO with the maximum pounds per second (0.094) of LH_2 that could be vented during S-IB stage boost. The Aero-Astrodynamics Project Office has informed us that there is no problem because of the small amount vented and that Dr. Geissler will document this to you in their weekly notes.

B.T. My surprise that DCR Board was not advised was based on our previous hard ground rule! No venting during 1st stage burn.

L. He has. I'm now satisfied. B

H-1 ENGINE LOX SEAL LEAK DETECTOR INTERLOCK: As a result of a DCR action a review of this interlock logic was made. The present design uses the signal from any of the 24 sensors as an interlock action in the preparation-complete chain up to ignition command. From that command to liftoff the voltage signal from 2 of the 3 sensors on each engine is interlocked to provide cutoff. In order to increase the probability of launch in the last minutes of countdown if one sensor failed and sent a false signal (normal failure mode is open - no signal) it was decided to substitute the voted logic relay for the any-sensor relay in the preparation-complete chain. The any-sensor signal will still be displayed via lamp and analysis data is available on the DEE-6 printout. This decision has been discussed with KSC/LVO personnel.

S-IB STAGE TANK TOOLING: Ling-Temco-Vought is now completing the last tank for S-IB stages 13 through 16. The last tank is expected to be shipped on 10/7/68. Plans are being formulated to store the government furnished tooling at Michoud in order to maintain the manufacturing capability should any S-IB tanks be required in the future.

S-IVB-506 STATIC FIRING: The S-IVB-506 static firing which was successfully conducted on 7/17/68 verified proper stage operation with the reduced LH_2 tank pressures.

DEATH OF SATURN IB EMPLOYEE: Mr. Lyle D. McIlwain died last night of a heart attack. Mr. McIlwain came to MSFC in mid-1964 from Thiokol Chemical Corporation and was employed in our Systems Engineering Office.

NOTES 7/22/68 WILLIAMS

B 7/25

1. Launch Vehicle Working Group: On July 19 Bill Huber transmitted to Milt Rosen copies of the reports and we are continuing to work on refining the data and answering questions from the working group. IO is distributing copies of the reports for comments.

Milt Rosen has requested a two-week extension (August 1 to August 15) on completion of his final report for the PSG. He will not have any written material for the July 23 PSG meeting at Goddard.

We will present a summary of the Rosen studies for you at 2:00 p.m., Monday, July 29, 1968, in the 10th floor conference room.

2. Bioscience Experiments: John Mason, MTX, and John Hilchey (ASO) prepared the draft document "Contribution of Man to Space Biology Flight Programs" as input to the Program Source Document for the Bioscience Program Memorandum. The paper is due on about August 15 and is now being reviewed within MSFC. We have been asked to help in a follow-on effort to explore presented alternate approaches through this fall. This may be a problem in view of an interpretation that Dr. Mueller doesn't want us to work in the Bioscience area. I am looking into this and will present the overall situation to Mr. Weidner shortly.

E.W. To whom did he say that? B

Dr. Hilchey also contributed to the Bioscience Manned Experiment Program submission to the Sciences and Applications Section, EMSF Working Group PSG, especially in experiment description and time-phase planning. The concept of grouping bioscience experiments into compatible modules or Program Elements (Bio C, Bio D, E, and F) were reviewed. The Bioscience Directorate will incorporate new Program Elements into Bioscience Program memo to BOB.

3. Nuclear Propulsion: The second test (restart) of the Phoebus-2 reactor was conducted at NRDS July 18, 1968, (first test successfully accomplished June 26, 1968), to obtain reactor control characteristics and other design data over a wide operational range. Neither full power nor long duration were objectives.

At the 1350MW power level, a feeder valve signaled a malfunction and triggered emergency shutdown. Subsequent determination that the signal was erroneous led to restart for a very smooth and successful test. All test objectives were achieved. Maximum power level was 3670MW, total run time was 30 minutes.

4. Optical Communication Technology: Optical Communication contracts NAS8-21497 (Perkin-Elmer) and NAS8-21498 (Chrysler) were signed on July 12, 1968. Technology needs require to investigate "alternate approaches" using ground and/or space tests, as appropriate.

July 29, 1968

9-26-68

With comments

(non for DEP-A)

B 7/31

NOTES 7/29/68 BALCH

S-II-5 - Static firing countdown was terminated on 7/25/68 after LOX and LH_2 loading because of failure of the LH_2 vent valves. New vent valves have now been installed and will be checked out today. Tentative plans call for static firing on 8/1/68.

Reference my Notes of 7/15/68 regarding power failure on S-II-5 on 7/11/68. An intensive review of circumstances and procedures has been underway to prevent recurrence of this and similar incidents. Karl Heimburg visited MTF on 7/24/68 and corrective action will be coordinated with him. Gas volume in the duct was insufficient to have caused loss of the stage, and the LH recirc pumps were not damaged by this back flow. As previously reported, two recirc pumps were damaged in a subsequent independent inspection of insulation entry into the electrical connectors on the pumps and had to be replaced. Changes in the facility power circuitry are now being installed that will provide ease of positive verification in the Test Control Center of the status of all of the remotely located switches. Although there was no involvement of GE and Boeing in this particular incident, review of procedures utilized in areas under their control has also been initiated.

S-II-6 - Mods to Augmented Spark Ignition (ASI) lines have been installed on all engines except No. 5, and this engine has been lowered for ASI line modification LOX screen mods are to be started this week. Power-up is scheduled for 8/5/68.

S-IC-6- Preparations are in progress for static firing on 8/6/68. Major constraints are open paperwork, tight delivery date for POGO modification hardware, and possible conflict with with the S-II-5 firing. Reexamination and resolution of schedule is expected today.

Public Affairs - The President of Louisiana State University and the Chancellor of Mississippi State University, with other officials from each of these universities, were at MTF on 7/25/68 for discussions with Mr. Francis Smith, NASA Associate Administrator for University Affairs and Mr. Herbert Quinn of his office. I also participated in the discussions along with Mr. Harry Gorman and General O'Connor.

NOTES 7/29/68 BELEW B 7/31

ATM EXPERIMENT S082, NAVAL RESEARCH LABORATORY (NRL), CRITICAL DESIGN REVIEW (CDR): The NRL CDR will be held July 29 through August 2 at Boulder, Colorado. The review team will consist of representatives from NASA Headquarters, MSC, KSC, and MSFC.

KC-135 ZERO "G" TESTING: Zero "G" LM end film retrieval tests in a KC-135 aircraft were completed last week. The results of these tests are being studied by P&VE and cognizant experiment engineers.

ATM PRELIMINARY DESIGN REVIEW (PDR): We have scheduled the ATM PDR at this Center beginning with a general session at 1:00 p.m. Monday, August 26, with Tuesday and Wednesday being devoted to separate design group meetings and the pre-board on Thursday afternoon.

MDA DOCKING PORT DELETION: During the Baseline Meeting held at MSFC on July 24-25, it was tentatively decided (pending final minutes from Headquarters) to remove docking port #4 from the MDA (three of five MDA ports are now removed). The reason for its removal was weight reduction.

SATURN I WORKSHOP BUDGET: A meeting with McDonnell Douglas Astronautics Company concerning FY69 requirements was conducted at St. Louis on July 25. Funding reductions were discussed covering an assortment of line items to bring requirements in line with resources.

LM-A PROCUREMENT PLAN: The MSFC Program Office has agreed to coordinate the procurement package for the LM-A modifications with us to assure compatibility when the hardware transfer takes place. It is necessary to submit the procurement package to Headquarters as soon as possible to allow continuation of the Grumman effort in September directed toward a 1971 launch date.

BRIEFING TO DR. MUELLER ON WORKSHOP ATTITUDE CONTROL SYSTEM (WACS): MSF has requested that we prepare a briefing for Dr. Mueller on the WACS. The briefing is also to include tradeoff factors involving CMG's versus a bipropellant (WACS) system for the Workshop. No date has been set but is is expected to be about mid August.

AAP PROCUREMENT RESTRICTIONS: Hal Luskin's office has advised that the July 12 teletype from Director of Procurement, which required all AAP procurement actions be approved by Headquarters, is being rescinded. This enables AAP to incrementally fund contractors, make scope changes and process relatively "small dollar" purchases without Headquarters approval. The other procurement restrictions applied October 1967 still apply to AAP and other MSFC programs.

NOTES 7-29-68 BROWN

B 7/31

H-1 Engine - The H-1 engines in S-IB-12 performed as predicted during the long duration static test on July 25. Inspection after the test revealed no hardware anomalies.

The LOX pumps were disassembled on July 27. The vented bellows LOX pump seals were in acceptable condition. The retrofit of the vented LOX bellows seals in S-IB-205 is scheduled to begin approximately August 5, 1968.

F-1 Engine - POGO - The notes of 7-8-68 concerning MSFC turbopump testing erroneously reported that with helium injection the LOX feed system first mode natural frequency was 2.5 cps. Actually, the testing was with a fully charged helium accumulator. The reported indication of a second mode frequency at 12-14 cps has not been confirmed by detailed data analysis. At RETS, the planned ten test program on engine F-4028 to validate the POGO solution as related to the F-1 engine was completed with seven tests conducted during the period July 22-26. Test conditions included 2 [redacted], "soft" shutdown, S-IC-6 static test conditions, and flight LOX pressure simulation with the prevalve charging sequence. Following the bomb test reported last week, the gas generator ball valve and injector were replaced and a stability rating test was conducted on July 22. The engine damped in only 8 ms with no indications of gas generator instability.

KSC - During replacement of prevalves and a PVC duct on S-IC-3 at KSC, small metal particles were found on the pump inlet inducer blades of the engines in positions 2, 3, and 5. Numerous particles, which appeared to be nickel and steel, of the order of 0.001" x 0.005" with a few larger particles of approximately .125" x .125" x .005" were noted. The particles appear to be within acceptable limits. However, Rocketdyne is making a determination of the acceptability and The Boeing Company is trying to determine the source.

Dieter Gray

J-2 Engine - Failures of the J-2 engine pressure transducer housings as a result of stress corrosion of the housing material have been found. A failure of this type results in external leakage. Six failures of this type have been reported previously but at the time were identified as being caused by lack of weld penetration. Some of the more critical failures would be in the start tank and the helium control bottle systems, particularly as affecting restart. (This failure mode, however, is not related to any of the AS-502 anomalies.) All transducers are being evaluated to determine failure impact and the Laboratories are assisting Rocketdyne in selecting an acceptable fix. Any impact on AS-205 and AS-503 is being assessed.

looks like a new rash of contamination. Any suggestions? B

During an attempted firing of the S-II Battleship on July 28, engine number four failed to reach mainstage. The preliminary analysis indicated LOX starvation to the gas generator; 131 tubes were split in the combustion chamber. The gas generator LOX bootstrap line and the gas generator control valve were removed. Foreign material was found which probably restricted LOX flow to the gas generator. Efforts to identify the material are continuing.

B 7/31

NOTES 7/26/68 CONSTAN

VISITORS TO MICHOUD

On Thursday morning, July 25, 1968, Mr. Francis Smith, Assistant Administrator for University Affairs, accompanied by Mr. Herbert Quinn of his office, visited Michoud. After being given a briefing by the Michoud Manager, Messrs Smith and Quinn were given a tour of the facility before their departure for the Mississippi Test Facility.

NOTES 7/29/68 GEISSLER

B 7/31

1. AS-502 Lateral-Longitudinal Coupling: Our study of the lateral-longitudinal coupling, observed on AS-502, has finally produced reliable results which have been reported to Mr. Goerner and other people at P&VE. The study includes digital and analog simulation of the longitudinal POGO phenomenon, the lateral bending and control system coupling and the coupling between lateral and longitudinal vibration modes due to the LM asymmetry, The simulation also features time varying coefficients. Summary of results are the following: (1) The model demonstrates the POGO instability as observed during the 110 - 120 sec flight time; (2) With a Δ thrust of 20,000 #, due to POGO oscillations, we obtain about 0.6 g longitudinal acceleration and 0.3 g pitch (lateral) acceleration in the LM. The last figure is somewhat lower than observed in flight; (3) Elimination of the POGO instability in the model by detuning the first LOX suction line frequency to 4.1 cps reduces the longitudinal oscillation and the lateral response of the CM and the total space vehicle substantially; (4) Shifting the POGO instability to 4.5 cps, i.e., separating it from the coupled LM frequency, decreases the gain of the coupling mechanism substantially (approximately factor of 10). This results in a proportinate reduction of the lateral response of the LM and vehicle; (5) No evidence was found of a coupling between control system and longitudinal oscillations on 502. Plans for future analysis include updating LM model (coupling mechanism) based on results of short stack test, (important factor in view of remaining discrepancy with flight data) and incorporation of POGO fix. Prediction of loads upon S/C will depend critically on this study.

E.G. Sounds like a huge step toward full understanding of what happened in 502. Congrats to all involved! I guess we are appraising MSF, Apollo Progr. Office (George Haje) and MSC (George Low) of this?

B

2. Effects of Unsteady Oscillating Shocks Prior to and at the Time of SLA Failure: (See Note 7/8/68 - same subject, attached) Our estimates of conservative upper limits for the unsteady aerodynamics loads connected with the plume induced flow separation observed on 502 have been reported at the last POGO teleconference on July 15, 1968. The lateral acceleration exerted upon S/C (on the LEM) caused by these forces is about $\pm$ .07 g. MSC considers these loads as large enough to be of concern in connection with other loads and further studies were requested by Gen. Phillips. We have analyzed the shock oscillations as recorded on the "ELOTS" chase plane film in more detail and have constructed a "most probable" resulting unsteady aerodynamic force which is irregular in time, but contains a noticeable component at LM frequency. Result lateral acceleration with this driving force is $\pm$ .01 g only; however, it is to be stressed that the confidence in this evaluation is rather low due to extremely meager experimental evidence. Since the assumption of a shock oscillation in resonance with the LM frequency cannot be completely discarded (due to POGO type plume oscillations or due to "natural" buffeting frequencies), it is felt that further in flight measurements of pressures in the rearward areas and possibly also some wind tunnel tests should be provided to gain a better definition of flight loads. However, we do not feel that these data would be mandatory prior to 503.

E.G. Please make a specific proposal package

B

NOTES 7-29-68 GRAU

B 7/31

1. MODIFICATION AND VALIDATION EVALUATION (MAVE): A presentation on the correlation of the AS-205/503 MAVE activity to overall system safety was made at the Sixth System Safety Technical Interchange Meeting in Seal Beach, California on July 18. Emphasis was placed on the organizational aspects of the validation evaluation to show how maximum safety assurance is being achieved with a thorough review and assessment of change actions. The presentation was well received and subsequent comments indicated that the MAVE results will be extremely beneficial in building overall confidence in the forthcoming launches. The safety assurance for these launches should also be definitely increased as the result of these positive efforts.

2. GSE PC BOARDS: RCA (Huntsville) has produced a new design on Printed Circuit Boards for use in the RCA 110A Computer. This design incorporates all MSFC suggested engineering improvements to overcome the many operating deficiencies experienced in the past.

3. TECHNOLOGY UTILIZATION: The solid state radiographic image amplifier being developed for NASA/MSFC was demonstrated to Dr. Richard Hsich, Director, Health Research, and four other officials of the Public Health Service (PHS). Dr. Hsich inquired as to how PHS could obtain these devices from NASA for some clinical evaluations. A portable x-ray unit of "attache case size" using the solid state radiographic imaging system is desired. Phase B of Contract NAS8-20185 is scheduled to deliver a suitable, improved image amplifier by May 1, 1969. This, in combination with a small, portable, low energy radioisotope camera can fulfill Dr. Hsich's requirements.

   - A presentation was made in Houston at the Third Annual Meeting of the American Association for the Advancement of Medical Instrumentation on selected nondestructive test devices developed for the Saturn V program. Devices discussed were Solid State Image Amplifiers, Neutron Viewing by Closed Circuit Television, Ultrasonic Scanning Devices, Liquid Crystal Temperature Indicators, and Eddy Current Thickness Gauges. The presentation was well received as indicated by the number of interested persons who came to the NASA/MSFC booth to view the hardware and request additional information.

4. QUALITY TRAINING: We have completed presentation of a course in High Pressure Systems at KSC for the Operations Support Directorate. The students were key Bendix and Air Force personnel. KSC was extremely pleased with the course and asked for additional classes as soon as possible. We made no commitment pending definition of the future of the training effort.

B 7/21

NOTES 7/29/68 HAEUSSERMANN

1. Ring Laser Gyro. A three axis ring laser gyro assembly has been received from Sperry and is presently in our Lab undergoing evaluation testing. The assembly measures angular rates in three axes. In the normal position the units have been operating satisfactorily but in any other position erroneous data is obtained. Preliminary evaluation of this problem indicates a computer problem. The computer is provided with the gyro assembly. Dr. McDuff, a summer faculty employee, has the task of evaluation of this assembly. At the end of the summer, it is questionable whether this and other similar work can continue because of the shortage of qualified personnel. ✓

2. ATM Optical Efforts. At the request of Mr. Purcell, the NRL Principal Investigator, we have evaluated the optical system used in his spectro-heliograph (NRL-A). The system was evaluated by means of digital computer programs which were developed inhouse. These programs produced spot diagrams which displayed the energy distribution at focus for various field angles, wave lengths and diffraction grating positions. Mr. Purcell has reviewed this data and the resolution of his instrument from the computed data confirms his design data. ✓

3. ATM Star Tracker. Negotiations with the Bendix Corporation, Navigation and Control Division, for the ATM star tracker have been completed. This contract is for five flight and one prototype star trackers with the first prototype unit to be delivered in approximately seven months from the date of the contract. ✓

4. Support Activity for KSC. Mr. Weber's part time assignment as assistant to Dr. Gruene has been terminated with the draft of the final report. In this assignment, which took about 50% of his time, Mr. Weber managed the KSC-LVO part of the MSFC assistance program for Dr. Gruene as directed by your memo, dated January 5, 1968. This program originally called for 100 MSFC engineers for about 6 months (50 man years). MSFC and LVO subsequently agreed on 64 requests (32 man years). Actually, 45 engineers were assigned, performing for a total of about 16 man years. Reasons for these lower actual manhours were: (1) nonavailability of certain required skills, (2) careful screening of MSFC nominations, and (3) continuous control of the program. Dr. Gruene has made very complimentary remarks to me about this assistance and its efficient support. ✓

5. Personnel Achievement. Mr. George B. Doane, Branch Chief of the Inertial Sensors And Stabilizers Division, obtained his Ph.D. last week with the final examination. ✓

WH. → If he puts it in writing, we can pass the thanks along to the individuals involved, incl. Mr. Weber

B

B 7/31

NOTES 7/29/68 HEIMBURG

ACCESS ARM NO. 9 A meeting with KSC and Boeing engineering was held on Thursday, 7/25/68, to review testing accomplished and tests remaining for Access Arm No. 9 (Flow 3). Most of the revised criteria has been satisfied and it was agreed that arm would be in a condition to remove from the test tower on Thursday, 8/1/68, several days ahead of schedule. Next Arm 9 (Flow 1) will be available for installation on 8/13/68, and the control console available 9/1/68. Environmental chamber was received from Chrysler on 7/15/68.

S-II STRUCTURAL TEST PROGRAM The S-II (V7-21) Stage Structural Test, Phase IV, is scheduled for today, 7/29/68. This phase will involve LH_2 for the first time in this test program.

F-1 ENGINE Work commenced on the fabrication of the fuel pulsing system for the West Area F-1 Test Stand. The first fuel pulsing test is scheduled for 8/10/68.

F-1 TURBOPUMP (POGO) No testing was accomplished at the F-1 Turbopump Stand last week to keep from interfering with static test of S-IB-12. We are now modifying the test setup to pulse the fuel suction lines in order to gain confidence that fuel suction line pulsing can be accomplished at the engine stand without detrimental effects (P&VE has requested fuel suction line pulsing at the engine stand). Fuel suction line pulsing test should begin at the turbopump facility on 8/6/68. Lox system pulsing will resume at the completion of fuel system pulsing.

S-II-5 (MTF) The S-II-5 acceptance static firing test attempted on 7/25/68 was scrubbed at 5:30 pm due to failure of the LH_2 vent valves. During the LH_2 Vent Valve Cracking Test the No. 2 vent valve would not relieve when the tank was pressurized and vacuum applied. The No. 1 vent valve worked properly. During the Common Bulkhead Pressure Rise Test neither valve would respond to the open command and tank ullage pressure rose from 8 p.s.i.g. to 26 p.s.i.g. due to boiloff. The valves opened after reducing the ullage pressure by emergency dump procedure and pulling a vacuum on the vent valve sense line. Post-test examination revealed that the valves did not respond properly because of plumbing errors.

K.H. NARS B

S-IB Test SA-56 was conducted on 7/25/68. This was a duration test, lasting 145 seconds, on stage S-IB-12. The stage is scheduled to be removed from STTE on 8/6/68. Inspection after this run showed that all lox pump seals were satisfactory.

TORNADO DAMAGE A small tornado hit Test Lab on 7/28/68 at 2:45 pm. An office trailer near Bldg. 4583 was turned over and heavily damaged. A wall panel was blown off the Instrument Lab, Bldg. 4650 and other minor damage to the area was sustained. There were no personnel injuries.

B-1/21

NOTES 7-29-68 HOELZER

NEGATIVE REPORT.

NOTES 7-29-68 JAMES

B 7/31

1. POGO Fix for S-IC-3:

POGO modified Whitaker prevalves have been installed in S-IC-3. ✓

2. S-II "B" Structure Test:

Investigation of the S-II "B" Structure failure is still in process. Cracking of a stringer during assembly appears to be a possible contributor to the failure. The forward skirt from S-II-10 will be used, along with a new S-IVB interstage, to repair the structure. The new completion date for testing is November 27, 1968. ✓

3. S-II Common Bulkhead

In reference to your comment on the Lucas Notes of 7-1-68, the ultrasonic indications of debond in the S-II common bulkhead are believed to be interpretation anomalies. R-QUAL is investigating further for any indications of deterioration of controls or workmanship and, if necessary, a team of R-QUAL, R-P&VE and R-ME specialists will be formed. (See Grau's Notes of 7-22-68) ✓

4. S-II-5 Static Firing:

The static firing of S-II-5 was scrubbed at approximately 5:15 pm on July 25, 1968, due to erratic LH_2 vent valve operation. Investigation indicated a loose sensing line probably caused the problem. The vent valves will be examined for any other problems. Static firing is set again for August 1, 1968. ✓

5. S-II Battleship Firing:

S-II Battleship was shut down 5 seconds after start (2 seconds of mainstage) by a Thrust O.K. switch from Outboard Engine No. 4. Cutoff was caused by a Gas Generator malfunction resulting in pump stall. Contamination was located in the G.G. and is believed to be the cause of the problem. Investigation is continuing. ✓

6. AS-503 Structural Assessment:

Informal progress report was given George Hage on July 26, 1968. Mr. Mulloy, P&VE, and Mr. Vale, MSC, have already established fine working relationships and a sense of urgency. MSFC/MSC working agreement will be reviewed by George Low today with signature expected. ✓

NOTES 7/29/68 JOHNSON

B 7/31

MSFEB Meeting - During the MSFEB Meeting 22 July, the MSFC Strapdown Experiment was considered. It was not approved. The initial reasons given were noncompatibility and excess weight. It subsequently developed that the true reasons were shortage of funds and the large number of experiments already approved for the very limited number of AAP flights. The experiment must be flown in the IU and it would be flown on one of the late Apollo flights as a passenger experiment similar to the S-027. Therefore, the Experiments Office recommends that the experiment be continued. We will attempt to find funding from a source other than the AAP Experiments Definition and Development Accounts.

Manufacturing in Space - Subsequent to the MSFEB, Mr. Lake met with Mr. Armstrong (OMSF-MT) to discuss experiment funding for FY 69. Mr. Armstrong firmly supports "Manufacturing in Space." He will attempt to make available at least $300,000 to begin definition of the proposed in-house experiments and to initiate limited contracted effort to define an experiment program in which industry would participate. Lack of assurance of funding for the other experiments currently in definition does not appear to be due to a decision not to continue, but due to no decision having yet been made. We assume that the $1.2M residual funds currently at the Center, being held because of the block against obligations, will ultimately be made available for MSFC's use. However, it is becoming increasingly clear that the funds will not necessarily be used for the originally specified experiments. We have been requested to submit a modified Experiment Program Plan.

Experiment S-074 - Cosmic Ray Electrons - Messrs. Absher (R-QUAL), Engler (R-P&VE) and Lake and Miss Smith (R-EO) visited the Laboratory for Astro-Physics and Space Research of the University of Chicago on Thursday to discuss the structural configuration and the qualification requirements of the Cosmic Ray Electron Experiment currently being developed by the University of Chicago.

Our contacts with this group have led to an increasing respect for their abilities. They are housed in an extremely well-equipped building. They have about one hundred people; eight to ten senior (post-graduate) researchers, thirty graduate students, thirty-five technical support people and thirty-five data analysts. They have underway currently two flight projects, a continuing balloon-borne research program and data reduction from previous experiments; all in cosmic ray physics or closely allied fields. They have had twenty-two successful satellite experiments in twenty-two attempts.

B 7/31

NOTES 7/29/68 KUERS

1. Contingency Payload for SA-503: This time we are modifying only the SM part of the BP 30 payload. The modification consists of the replacement of the ballast tanks. Two of the tanks are 51" in diameter, the other two 45". These tanks are being fabricated in-house. Four of the eight bulkheads have been completed. Two have been welded into the cylinders using specially designed fixtures which have worked well. The first bulkhead weld required no repairs; inspection of the other is not complete. The schedule is really very tight and hence we are operating two shifts - no overtime has been applied so far.

2. Payload Simulator: We are shipping to MTF an acoustic test article recently completed in-house. The article will be used in a P&VE program to determine the acoustic responses of a payload suspended in a 22' diameter honeycomb shroud. The shroud is made up of test panels originally intended for the Centaur/Voyager Program; the payload is a rack structure carrying a 70" diameter Saturn I structural test tank. The assembly job was performed on low cost wooden tooling and labor was applied on an as-available basis. The shipping trailer is a modified Saturn V thrust structure transporter.

B 7/31

NOTES 7-29-68 LUCAS

1. J-2 ENGINE-TO-STAGE ATTACH BOLTS: Reference Notes-Lucas-6-17-68. A new Standard "Threaded Fasteners, Torque Limits for" MSFC-STD-486 is in preparation. This proposed standard should benefit both MSFC and its related contractors since it expands the range of fastener tensile strengths and will update torque values listed in the presently used ABMA-STD-18. The document is being coordinated with R-QUAL and R-ME and will replace the ABMA Standard.

2. S-II-A-STRUCTURE TEST: Test phase II (cycle proof test and influence loads on fill and drain fitting) and test phase III (influence test) were run during the past two weeks. Testing with LH_2 is planned for this week. At the beginning of this test phase, we were 16 days behind the established schedule. The splendid cooperation of R-QUAL in inspecting of the A-structure between test phases has resulted in 11 days of schedule recovery.

3. POGO: The next POGO Working Group Meeting and the next Management Review to General Phillips are tentatively scheduled for 8-13 & 8-16-68, respectively. The first phase of the short stack dynamic test at MSC has been completed. The tests completed to date include longitudinal, pitch, and yaw forced response tests. The test program to date is considered successful. A cursory evaluation indicates that the math model is a reasonable representation of the test results.

4. S-II FLEX LINES: Our assessment of the number of flexible lines to be tested to confirm their integrity for flow induced vibrations was completed. Criteria for the review was established between NR and our Propulsion and Structures Divisions. Two lines each of eight different bellows systems must be flow-tested by the AS-503 CDDT.

5. AAP-2 0-g HARDWARE: An engineering review of the zero-g hardware was conducted at the MDC Santa Monica facility on 7-22-68. The mockups are proceeding well on schedule, and very few discrepancies were noted. None of these would require much work nor extend the scheduled completion date. In general, the design's workmanship and engineering are excellent, and the latest color schemes have been used. MDC is preparing for the NASA review of the zero-g hardware on 8-1-68, at which time personnel from MSFC, MSC, Wright-Patterson AFB, and MDC will convene at Santa Monica to be briefed on the hardware and the status of the attendant paperwork.

6. EVA AD HOC WORKING GROUP: The group will make the recommendations to its respective Program Managers that: a) egress from the LM ascent forward hatch be baselined for ATM film retrieval, b) that the film retrieval work stations be moved such that the LM end work station is 45° around the ATM from the LM forward hatch and the sun end workstation is directly beneath the hatch. It was agreed that the manual translation concept be established as the baseline for LM/ATM EVA (for Astronaut translation).

7. FUTURE HUMAN FACTORS RESEARCH PROGRAMS: At the request of Dr. Johnson, R-EO-DIR, Dr. Jon Rogers from our Human Factors organization participated in a coordination meeting at NASA Headquarters with personnel from OMSF and OART. Dr. Rogers presented our Laboratory human factors research programs presently funded by OART and explained the programs planned for the future. Considerable interest was expressed by those present in seeing that some of the future work be funded. OART has established a Man-System Integration Advanced Planning Group, and they will request MSFC representation. The first meeting of the Advanced Planning Group to develop a 5-year man-system integration plan is scheduled for 7-30-68.

NOTES 7/29/68 MAUS B 7/31

NATIONAL SPACE BOOSTER/APOLLO COST STUDY DATA COMPARISON:

The National Space Booster Study (being conducted by Chrysler under contract from Mr. Webb) is being monitored by NASA Headquarters and does not include MSFC participation. It is our understanding that various data inputs from the Saturn prime contractors are currently being reviewed by MSF. We have been informed that a cursory review indicates a wide discrepancy between the data submitted to MSFC for the Apollo Cost Study and data submitted to Chrysler on the National Space Booster Study. From a Center view point we feel there is a need to reconcile this data, or to understand the rationale between the data submitted to Chrysler and the data previously supplied to us. We are currently attempting to obtain copies of the Chrysler data.

H.M. I know. Let's discuss this during a Staff Luncheon. Please remind me to bring it up. B

TASK WORK PACKAGE SYSTEM:

The call to initiate the MSF Work Package System was received July 22, via letter from Gen. Bogart. It calls for Headquarters TWP submission by October 15, 1968. We need guidelines from MSF on AAP before we begin data collection. We are preparing internal instructions in anticipation of issuing a call about August 15.

Let's discuss this, too! B

SEPARATION OF UNIVERSITY OF ALABAMA IN HUNTSVILLE (UAH) FROM UNIVERSITY OF ALABAMA:

In March of this year you and Dave Newby met with the Huntsville City Father's (MSFC Advisory Committee) to advise that group of the Center's plans to discontinue the subsidy of the UAH graduate studies program. In response to this announcement the Advisory Committee requested your support in making UAH an independent university.

At Mr. Newby's request we have conducted a sensitive study of all considerations (academic, financial, legal and political) which are involved in pursuing the proposal made.

We are ready to present the results of this study to you at your convenience.

H.M.

Any time. Please lay on with Ed Mohlere. Make sure Shep attends it, too B

NOTES 7-29-68 MURPHY

B 7/31

System Safety Analysis for AS-503: General Phillips has issued a systems level task directly to Boeing for this analysis to be performed by Boeing TIE. Monthly reviews are to be given to General Phillips with the first review to be held August 18, 1968. We intend to have an in-house review of this effort, prior to the review with General Phillips. We will follow this effort closely and keep you informed of significant findings.

NOTES 7/29/68 RICHARD B 7/31

Background on the position taken at the Baseline Review regarding the unmanned rendezvous of the LM/ATM is as follows: The basis of Dr. Mueller's request to study the S-IVB restart was the possibility of savings to be effected on the LM-A modification. Definition of the extent of these savings depends on in-depth tradeoff analyses of location of capability in various modules of the cluster. We have initiated such studies in-house, with very limited support from Grumman (which understandably is reluctant to support such MSFC requests) but have made limited progress. The erosion of our position (indicated by Mr. Luskin's opening remarks) regarding both overall systems engineering responsibility for the cluster and hardware responsibility for the LM-A, cripples our efforts. Also there has been considerable lab indication that extensive testing is required on restart (including a flight test) before confidence can be established. We have pursued the problem far enough to establish feasibility of the S-IVB rendezvous but the difficulties are greater than if the LM, as presently defined, is used. We shall present our conclusions to you in detail within the next two weeks so that the Center position can be sent to Mr. Luskin as we promised at the Baseline Meeting. ✓

B 7/31

NOTES 7/29/68 SPEER

1. AS-205 Propellant Depletion Sensors: Last week Chris Kraft challenged S-IVB/AS-205 propellant depletion sensor arming at a time when the probability of achieving mission orbit with failed cutoff sensors is low. The July 26 Level I CCB decision on arming time (See Notes Teir), while not reflecting the total MSFC 3σ design goal, increases the crew risk only slightly and insures S/C orbit attainment even in the unlikely event of cutoff at arming. Tradeoffs between space vehicle mission objectives and the crew safety launch vehicle design considerations are becoming of increasing frequency and importance. It appears that more realistic measures for the actual flight hazards need to be developed (e.g. how "unsafe" is a J-2 LOX depletion). Our conservatism is likely to cause over-reaction to the other extreme.

L. R. Reasonable! B

True!

2. AS-205 Engine Out Africa Gate: ETR Range Safety has established criteria to command S-IVB shutdown in the event of S-IB engine(s)-out to prevent under all circumstances an impact of the S-IVB/IU in Africa. This, of course, would cause an early abort commitment for the S/C. MSC feels strongly that they must obtain as long an S-IVB burn time as possible due to the importance of the spacecraft mission to the Apollo Program, and that this far outweighs the risks associated with an Africa impact. KSC and MSFC support MSC in this position. KSC is expected to request an ETR waiver of the AS-205 engine-out Africa Gate.

3. AAP Ground Command Requirements: In coordination with MSC we have received a total of more than 1,500 proposed single RF commands to support the AAP missions. This far exceeds the capability of ground flight control. We are reviewing these requirements to effect a reduction to no more than 500 RF commands by either elimination, combining with other functions or making it an onboard function. In addition, we are evaluating MSC's proposal to backup critical IU functions, after insertion, with the airlock's command system.

See Below

That's too much! B

4. Facilities and Environmental Measurements on Pads 34, 37 and 39: A review of MSFC requirements for Facilities and Environmental measurements on Pads 34, 37 and 39 has been completed and served to identify the total MSFC (including primes) reduced requirements in this area in going from an R&D to an operational measuring list. These measurements (pressures, temperatures, vibrations, etc.) which add to KSC's measuring program are of importance for our launch and early flight engineering analysis.

B7/31

NOTES 7-29-68 Stuhlinger

No submission this week.

NOTES 7/29/68 TEIR

B 7/31

SA-205 LAUNCH VEHICLE STATUS: At this time there are no significant problems with any of the stage or GSE hardware. Installation of the carbon seals (bellows type) on the H-1 engine LOX pump cavities is scheduled for August 5, 1968. Installation of the change to the S-IVB Propellant Utilization (PU) System to allow flying the PU System open loop has been completed. Launch vehicle combined guidance and control tests are complete. ✓

Two changes to the LVDC Flight Program were approved last week. The Level I Configuration Control Board (Gen. Phillips' Board) approved the change in the arming time for the S-IVB stage propellant depletion sensors from the MSFC recommended time of +3 σ propellant depletion (approximately 599 secs.) to the MSC recommended time of nominal velocity cutoff (615 secs.). MSC actually stated that they preferred an arming time of 1 to 2 secs. after the nominal velocity cutoff time. MSFC's recommendation was based on the MSFC position that a propellant depletion is not an acceptable risk. The other flight program change was required to correct a problem associated with an LVDC hardware failure occurring in conjunction with simplex memory operation during part of the flight program routines, namely, the Compressed Data Routines. The Compressed Data Routines are used to compress and store data in orbit between ground stations. Compressed Data Routines were programmed in simplex memory to conserve memory. A memory failure during testing caused the flight program to address a non-existent memory module. The problem was fixed by reprogramming the Compressed Data Routine into duplex or redundant memory. In doing this it was necessary to eliminate a part of the Compressed Data Routine which was not mandatory in order to provide space for the duplex operations. Both of the above changes will be incorporated into the August 15, 1968, final flight program delivery to KSC. KSC has agreed upon this delivery date. ✓

I.U. STRUCTURE: During a documentation audit being conducted under the Quality Maintenance Program, IBM discovered a number of documentation discrepancies in the North American/Rockwell (NAR), Tulsa, records on the I.U. structure. The records indicated that 2.0 lb. per cubic foot core material was used in one of the I.U. structures. The I.U. structure uses both 3.1 lb. and 8.1 lb. core material at different locations in the structure. Although the records indicate that there was no 2.0 lb. core material used in the I.U.-205 structure, the records do indicate that the 3.1 lb. and 8.1 lb. core material was used at improper locations in the structure; however, this is believed to be a documentation error and a set of X-rays of the I.U.-205 structure is to be sent here from NAR, Tulsa, for correlation with X-rays of the structure made by IBM, Huntsville, during I.U.-205 structure assembly. These X-rays are not expected from NAR, Tulsa, until August 5, 1968, due to the priority being given to servicing the team formed to investigate both the SLA and I.U. honeycombed structure as a result of an action item assigned during the July 15, 1968, Space Vehicle Oscillation teleconference. We are attempting to get the X-rays delivered this week. ✓

NOTES 7/29/68 WILLIAMS B 7/31

1. Lunar Program: Mr. Ben Milwitzky of MAL was at MSFC on July 22, 1968, and presented to Dr. Rees and Mr. Weidner the case for the lunar roving vehicle. His chief aim was to get MSFC additional manpower support.

J. Belew attended the Group for Lunar Exploration and Planning (GLEP) meeting in Washington on July 25, 1968. Again, the LRV was voted as most desirable mode lunar transportation (man and scientific).